MARCH, 1954

SURGERY

GYNECOLOGY AND OBSTETRICS

Section

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INTERNATIONAL ABSTRACTS OF SURGERY

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COLLECTIVE REVIEW

FREE CHYLE IN THE ACUTE ABDOMEN: SO-CALLED CHYLE PERITONITIS

WILLIAM HOFFMAN, M.D., Brooklyn, New York

THE presence of free chyle in acute disease of the abdomen is a rare and unusual condition. The surgeon's immediate diagnosis is purulent peritonitis. And when the true state of affairs is finally divined (by certain criteria to be indicated) a threefold problem arises: What is the real cause of the acute disease? What part did the chyle play in the symptomatology? What is the best procedure for handling the case?

In a careful review of the literature, a total of 23 cases were seen wherein a laparotomy had been performed for an acute abdominal emergency and chyle was found free in the peritoneal cavity. The case to be reported is, thus, the twenty-fourth, and the following discussion is based on a study of these cases (see Table I).

In reviewing the literature, it was occasionally difficult to distinguish between a case of chronic chylous ascites per se and one in which free chyle was found with acute disease of the abdomen. This stemmed from the fact that on rare occasions such an abdomen, not operated upon for various reasons, gradually caused the development of chronic ascites (Hall and Morgan, Lieutaud, Percival, and Murphy). The dividing line was established on the basis that the acute symptoms must have subsided by the time of operation or tap. This was a problem particularly when abdominal trauma had produced an obvious emergency but operation was refused or deferred; the acute signs and symptoms gradually subsided and were replaced by an increasing abdominal distention finally diagnosed as ascites.

Thesis submitted to the Department of Graduate Surgery of the New York Medical College in partial fulfillment of the requirements for the degree of Master of Science in Surgery.

CASE PRESENTATION

A 23 year old negro male entered the hospital with pain in the right lower quadrant of 5 hours' duration beginning at 2:00 a.m. of the morning of admission. The onset of pain followed a fatty meal consisting of beef hash and evaporated milk and the patient vomited shortly thereafter. An enema produced only a small hard stool. The patient could not retain any fluids by mouth. After several hours the pain localized to the right lower quadrant and he found that he was most comfortable with his legs drawn up toward his abdomen. The past history was essentially noncontributory. On examination the patient was noted to be in obvious pain with his legs drawn up as noted. His temperature was 99.8, pulse 84, respiration 20, and blood pressure 150/100. The important findings were limited to the abdomen. There was exquisite tenderness in the right lower quadrant associated with muscular spasm and rebound tenderness. Rectal examination disclosed moderate tenderness on the right side. With these findings a diagnosis of acute appendicitis was made and immediate laparotomy ordered.

The abdomen was opened through a right rectus muscle-splitting incision and on incision of the peritoneum it was noted that there was free milky fluid in the operative area. This appeared to be an obvious purulent peritonitis. The appendix was brought up and found to be long and

congested, but certainly not in a state of suppuration. Further exploration disclosed that a loop of ileum about 1 foot long was caught in a noose produced by the adhesion of an elongated appendix epiploica of the ascending colon to the medial mesenteric leaf of the right colon. The obstructed ileum was moderately distended as compared to the rest of the small bowel, but the outstanding finding was the large number of small, white, slightly elevated spots on the surface of the involved bowel. These looked like fibrinopurulent plaques but they could not be wiped off and were apparently subserosal in location. The mesentery of the involved ileum was edematous and had some white streaks in it. It was surmised that the white spots on the bowel were distended lacteals and the free fluid was chyle that had escaped through the bowel serosa from lacteals obstructed during the height of digestion of a fatty meal.

The obstructing band was easily resected and an appendectomy was also performed. It was noted that in the time necessary to complete these procedures the distended lacteals had practically disappeared from the surface of the ileum and very little free chyle could now be found. Unfortunately, a specimen of abdominal fluid taken for laboratory examination was "lost" en route to the laboratory. The abdomen was closed without drainage. The postoperative course was entirely uneventful.

HISTORICAL

In 1694, Morton described the case of a 2 year old boy who developed ascites despite the presence of an unusually good appetite. He deduced that the patient was probably losing nutritional elements into the free abdominal cavity and should thus have a chylous ascites. This was confirmed by paracentesis. He wrote:

"But at the very beginning of the Fever his belly began to be distended with a dropsical swelling, which increased strongly everyday; his Cough and shortness of Breath at the same time growing worse; All which symptoms were at length accompanied with an Atrophy of the Parts, even to the degree of a Marasmus. But yet when his body was a perfect Skeleton, and the Dropsie at a high Tide (which was very remarkable) he had a brisk and healthful look, and a lovely countenance, without the least Tincture of a yellowness, and a good, or rather greedy Appetite, and that to the very day he dyed. From whence I did rightly conjecture, and always told his Friends, as my opinion, that his Dropsie was truly chylous, caused by the chyle flowing into the cavity of the Belly by lacteal vessels upon some rupture that had been made in them; which appeared very plainly from the Event."

Numerous instances of accumulation of chylous fluid in various cavities of the body have been reported since Morton's classical description. In 1944 Jahsman reviewed the literature and counted 104 cases of chylothorax including his own. Chylous ascites has been reported frequently enough so that it cannot be considered unusual. The most common cause is obstruction or compression of the cisterna chyli or thoracic duct by neoplasm. However, the findings of free chyle during a laparotomy for an abdominal emergency is a completely different state of affairs and a unique one.

The rarity of this condition is attested to by the fact that all but one of the articles in the literature concern single case reports, the exception being that of Davis whose experience includes 3 such cases. Another interesting feature is that in no case was the presence of chyle suspected preoperatively. The first report in the literature was made by Renner in 1910 who described the finding of free chyle in the hernial sac of a 24 year old male with a strangulated inguinal hernia. The strangulation was released and a routine repair done with uneventful recovery. Strangely enough, the second report in the literature, by Prange in 1912, concerns an almost identical case in a 62 year old male.

In 1921, Guldmann reported the case of a 14 year old boy who suffered a blow to the abdomen and thereafter developed signs of peritoneal irritation. At laparotomy he was found to have a tear at the base of the mesocolon from which chyle was oozing. This was presumably a laceration of the cisterna chyli or lower thoracic duct. A similar case was described by Hansen in 1923. His patient was a 32 year old male who fell on a wheel and within 6 hours developed the signs of an acute abdomen. The findings at operation were similar to those of the preceding case—a swelling at the root of the mesentery with free chyle oozing therefrom. Also in 1923, Golm reported on a 29 year old female who developed the classic picture of appendicitis. At laparotomy there was a milky exudate present which contained fine fat particles. The appendix did not appear to be involved and the author suggested a ruptured chylous cyst, which, however, was not found to be the cause. Dutton, in 1930, on the other hand, did find the walls of a ruptured chylous mesenteric cyst, which had caused an acute condition of the abdomen in a 36 year old female patient. Her abdomen was full of milky fluid and the ruptured cyst was found in the mesentery of the ileum 18

inches from the ileocecal valve. The cyst was marsupialized to the parietal peritoneum and packed with gauze. Appendectomy was also performed.

In 1931, Cohen described the case of a 63 year old male who was seized with sudden violent abdominal pain and subsequently developed rigidity of the upper abdomen. A diagnosis of perforated peptic ulcer was made, and milky fluid was found on entering the peritoneal cavity. However, no ulcer was found, and further exploration revealed the lymphatics of the mesentery and intestine to be enormously dilated. The appendix was slightly inflamed. Appendectomy was performed and the abdomen drained.

In the same year, Rosarius reported the case of a 20 year old female in whom the signs and symptoms suggested a walled-off perityphlitic infiltration, but at laparotomy the salient finding was a cylindrical, shiny, white-walled swelling of the mesocolon and retroperitoneal tissue in the region of the ascending colon.

In 1932 Papenberg described a case very similar to the one reported by Cohen in which the violence of onset and the physical findings suggested a perforated peptic ulcer. There were from 300 to 400 c.c. of white oatmeallike fluid in the abdominal cavity and the omentum was covered with plaques of whitish yellow exudate. This was the only mortality in the entire series, and the patient died shortly after completion of the operation. The author suggests that the apparently overloaded lymphatic system produced a rupture of the lacteals, peritonitis, paralytic bowel, and death. Postmortem examination failed to disclose any lymphatic abnormality, ruptured cyst, or other possible cause for the free chyle.

Dimtza, in 1934, reported a case in which the lymphatic obstruction was caused by a band strangulating a loop of ileum. Also in 1934, Weber (135) described a case of volvulus of the small bowel accompanied by a chyle "erguss" in a month old infant, the youngest patient in the entire group. Synek, that same year, reported another of the pseudoappendicitis cases with free chyle in the abdomen. Boerema, in 1936, followed with another case suggestive of perforated peptic ulcer. DePlanque, the same year, described a patient who was at first thought to have a perforated ulcer, but whose pain later localized to the right lower quadrant and the diagnosis was changed to appendicitis. Kleber, also in 1936, described a case thought to be appendicitis, in which free chyle was found in the abdomen.

In 1938, Reboiras and Giralt reported an unusual sequence of events in a patient, first thought to have appendicitis, in whom free chyle was found. The patient initially did well but subsequently developed complications and died several weeks later of miliary tuberculosis. Permission for autopsy was not obtained, but the authors suggest that the etiology for the free chyle was thoracic duct obstruction in the mediastinum by tuberculous glands, the miliary process postdating the operation.

The paper by Davis, in 1939, covers the greatest experience with this condition. He reported 3 cases: one due to trauma in which the small intestinal mesentery was filled with distended chyle, another with lower abdominal pain suggestive of appendicitis in which engorged chyle vessels and a white exudate were found, and the third in which an intestinal obstruction was suspected. The last patient had had an appendicitis with diffuse peritonitis 10 months previously, and at the second laparotomy the outstanding feature was the tremendous enlargement of the lymphatics and lymph glands of the ileum, many of the glands to diameters of one-half inch. No adhesions were found and the author ascribed the chyle peritonitis to a severe mesenteric adenitis obstructing the flow of chyle from the intestine.

Maier, in 1940, reported on a patient with a syndrome suggestive of perforated ulcer or mesenteric embolus. The author theorized that the free chyle in the abdomen resulted from obstruction of the thoracic duct by an enlarged rheumatic heart.

Levering, in 1944, described a case due to trauma of the retroperitoneal structures. Stevenson and Frankel (117) followed in 1945 with the report of a case in which a small arteriovenous aneurysm between the left subclavian artery and vein was believed to have produced a rupture of the receptaculum chyli and/or lacteals.

The most recent report was made by Karp and Harris in 1951. In their patient the train of events suggested an acute cholecystitis or a perforated ulcer. An interesting point was the fact that the patient had complained of tenderness, stiffness, and swelling of the neck 48 hours prior to admission to the hospital. Her abdomen was full of chyle, with the, by now, familiar accompanying findings. The authors suggested the possibility of thoracic duct involvement as the cause.

PATHOLOGICAL ANATOMY

The anatomy of the chyle system is too familiar to be discussed in great detail. The thoracic duct, which is the main collecting duct of the entire lymphatic system, extends from the second lum-

TABLE I.—TWENTY-FOUR CASES IN WHICH EMERGENCY LAPAROTOMY WAS DONE

Author	Age of pat.	Sex	History	Relation to meal	Physical findings	Operative findings	Procedure	Outcome	Etiology	Remarks
(1) Golm	29	F	24 hrs. of general abdominal pain shifting to the right lower quadrant	Not noted	Tenderness at McBurney's point. T. 37, Pulse 100.	Appendix slightly reddened, not acutely inflamed. Milky exudate present which contained fine fat particles.	Appendectomy with iodoform drain to peritoneal cavity.	Recovered	Unknown	Author suggests ruptured chylous cyst, which was not found.
(2) Boerema	52	M	Onset sudden, as if patient's abdomen had ruptured. No nausea or vomiting.	Heavy meal 6 hrs. before.	Patient, white, could not breathe deeply because of pain in abdomen. Abdomen resistant all over, boardlike in upper half. Pain in RLQ less than in upper abdomen. No LLQ pain. Perforated ulcer suspected although abdomen was not quite as rigid as expected and liver dullness was present. No shoulder pain.	Small bowel mesentery loaded with chyle, white plaques on bowel wall.	Upper midline incision. Exploratory laparotomy. Closure without drainage.	Recovered	Unknown	
(3) DePlanque	31	M	Onset 1 hr. after meal. Increase of pain suggested perforated peptic ulcer, but later localization to right hypochondrium led to diagnosis of acute appendicitis.	1 hour after meal.	Entire abdomen spastic, at first mostly in upper portion, but later shifting to RLQ.	Small bowel and its mesentery appeared white, with milky exudate in peritoneal cavity. No sign of ruptured serosa.	Two incisions made. First a McBurney, then a midline one to exclude perforated ulcer. Two drains in RLQ.	Recovered	Unknown	
(4) Kleber	24	M	36 hr. history of sudden onset of continuous pain in the abdomen, relieved by bending the knees and accompanied by nausea and vomiting.	Last meal was rich in fat.	Right rectus spasm. Deep tenderness over the appendiceal area. Patient not acutely ill. Pain on pressure in the pouch of Douglas.	Small bowel and its mesentery filled with distended lymphatics. Free chyle present in peritoneal cavity.	Paramedian incision. Laparotomy without drainage.	Recovered	Unknown	
(5) Davis	52	M	24 hrs. of generalized abdominal cramps. Nausea but no vomiting. Tender across entire abdomen. One previous attack of appendicitis 7 yrs. before with spontaneous recovery.	Onset a short time after a heavy meal.	Appeared sick and anxious, abdomen distended and tender over entire area below umbilicus. T. 99.3, Pulse 88, R. 24, Wbc. 10,500.	Engorged chyle vessels. White exudate.	Drainage without appendectomy	Recovered	Unknown	
(6) H. Cohen	63	M	Acute onset, 6 hrs. before admission, of violent abd. cramps and vomiting.	No history of food relationship.	Abd. rigid, especially in RUQ. Knees flexed. T. slightly elevated. Pulse poor. Wbc. 14,000. Suggestive of perforated ulcer, but liver dullness was present and there was no shoulder pain. Patient very sick. Diagnosis: mesenteric thrombosis.	Milky fluid in abdominal cavity. No ulcer found, although it was thought at first patient had perforation. Lymphatics of intestines and mesentery enormously distended. Appendix slightly inflamed.	Appendectomy with drainage.	Recovered	Unknown	
(7) Papenberg	32	M	Sudden onset of severe abdominal pain. Patient felt as if something tore in his abdomen. Pain became localized in stomach region. Patient became nauseous and vomited. Saw physician 3 days later who sent him to hospital on 4th day.	Hearty eating and drinking prior to attack.	Patient appeared quite ill. Tp. 36.4 C. P. 120. Abd. diffusely tender especially in the periumbilical region. Diagnosis: perforated ulcer of 4 days duration.	300 to 400 c.c. of white oatmeal-like fluid present in abdominal cavity. Omentum and small intestine covered with plaques of whitish-yellow exudate. Parietal and visceral peritoneum dark red and dull. Exudate contained fatty elements but no cells.	Laparotomy and drainage	Died 15 min. after operation.	Unknown	Patient's lymphatic apparatus overloaded, with rupture of lacteals giving peritonitis, paralytic bowel and death.

(8) Rosarius	20	F	Onset 2 days prior to admission with sudden pain in upper abdomen spreading to entire abdomen. On 2nd day, the pain shifted to the right side and became worse.	Followed a rich meal.	RLQ sensitive to pressure associated with sensation of pelvic infiltration. Tp. 37.2 C. Diagnosis: Walled-off perityphlitic infiltration.	Mesocolon and retroperitoneal tissue in region of ascending colon appeared as cylindrical swelling with shiny white wall.	Pararectal incision; laparotomy and drainage.	Recovered	Unknown	Suggests rupture of lymph vessels after heavy meal.
(9) Synek	19	M	4 day history of vague abdominal pain. Then after a fatty meal, the pain became greater and localized in the RLQ.	Followed a fatty meal on 4th day.	Spasm and rebound tenderness in the RLQ.	Free chyle in the abdominal cavity. Mesentery loaded with distended chyle vessels.	Appendectomy with drainage. Right pararectal incision.	Recovered	Unknown	Patient developed intestinal obstruction 6 mos. later. No chyle found at reoperation.
(10) Davis	36	F	24 hr. history of generalized abdominal cramps and nausea. Began after blow to abdomen.	Onset two hrs. after heavy meal.	Tp. and pulse normal. Lower half of abdomen distended and tense.	Milky fluid in lower half of abdomen. Extraperitoneal bleb filled with chyle. Small intestine and mesentery filled with distended chyle vessels. App. fibrosed. No enlarged glands noted.	Appendectomy with drainage.	Recovered	Trauma	
(11) Guldmann	14	M	Patient hit in abdomen below umbilicus by blow from elbow. Felt well until next day when he vomited and the abdomen became slightly distended and painful.	Kept on eating after blow, until pain began.	Abdomen diffusely tender to pressure with resistance greater in LLQ. No rebound. Abdomen slightly distended.	Chyloperitoneum. Omentum and transverse mesocolon covered with white plaques. Egg-sized swelling at root of mesentery. Tear in mesocolon near its root 3–4 cm long. Second tear above it 2 cm. long. Pressure over mass produced chyle.	Lower midline incision. Tear in mesocolon sutured with catgut. Retroperitoneal drain and iodoform gauze packing.	Recovered	Trauma	Probable tear in one or more radicals of receptaculum chyli.
(12) Levering	35	M	Lower abdominal pain of 24 hrs. duration localizing to the right side, with pain on deep breathing. Had auto accident 2 weeks previously in which patient was thrown against steering wheel.	No history of food relationship.	Abdomen slightly distended, with moderate rigidity, more marked in RLQ. Peristalsis active. Rectal examination gives abdominal pain. Wbc 13,800 with normal differential. Diagnosis: Acute appendicitis.	600 c.c. milky fluid in abdomen. Mesentery of ascending colon white as well as posterior parietal peritoneum. Mesentery of small bowel showed engorged lymphatics. No enlarged glands.	Right rectus incision. Appendectomy, without drainage.	Recovered	Trauma (retroperitoneal?)	Laparotomy 3 mos. later for obstruction disclosed no chyle
(13) Prange	65	M	Pt. had hernia on right side for 25 yrs., wearing truss for 15 yrs. until it ceased to control hernia. Repeated incarcerations reduced until last episode. This one irreducible and accompanied by severe pain in stomach region.	Incarceration followed heavy midday meal.	Tp. 36.5 C. P. 130–140. Abdomen sensitive to pressure and slightly distended. Scrotum distended to size of man's head, with penis invisible in the mass.	Small intestine, appendix and ascending colon in sac of hernia. One loop of small intestine was tense, and chylous vessels appeared distended with milky substance. Milky fluid in the sac.	Repair of hernia in routine fashion	Recovered	Strangulated hernia.	
(14) Renner	24	M	Patient had hernia with wearing of truss for 16 yrs. 5½ hrs. after meal, hernia became incarcerated and irreducible.	5½ hrs. after meal.	Scrotal hernia size of man's fist.	Mesentery and intestine contained chyle-distended vessels. Free chyle in the hernial sac.	Routine repair.	Recovered	Strangulated hernia.	
(15) Dimtza	24	M	Past episodes of abdominal pain and colon complaints. Pain of this attack began in entire abdomen and then localized in LLQ.	Heavy evening meal before attack.	Tp. 37.4 C. WBC. 11,200. Localization of pain in LLQ.	Loop of ileum strangulated by a band. Mesentery edematous with white strands running through it to give it a white appearance. Milky fluid in abdomen. Chyle disappeared from mesentery on release of bands.	Exploratory laparotomy and release of band.	Recovered	Intestinal obstruction due to band.	

TABLE I.—TWENTY-FOUR CASES IN WHICH EMERGENCY LAPAROTOMY WAS DONE—Continued

Author	Age of pat.	Sex	History	Relation to meal	Physical findings	Operative findings	Procedure	Outcome	Etiology	Remarks
(16) Davis	12	M	History of acute appendicitis and diffuse peritonitis 10 mos. previously. 5 hr. history of sudden cramps in lower half of abdomen. No vomiting. Intestinal obstruction suspected.	Not stated.	Tp. 99.2. P. 96. R. 24. Wbc. 7,500. Lower half of abdomen tender.	Milky fluid in abdomen. Tremendous enlargement of lymphatics of ileum. All abdominal lymphatics enlarged, many to diameters of ½ inch. No adhesions.	Exploration and closure of abdomen.	Recovered	Mesenteric adenitis.	
(17) Dutton	35	F	"Stomach trouble" for 2 yrs. prior to admission. Occasional nausea and vomiting. No pain. Thought abdomen larger recently. In a.m. of day of attack, had sudden attack of pain of severe nature in entire abdomen. Vomited several times. 1 bowel movement.	Not stated.	Tp. 99.2 P. 104. R. 22. Abd. distended and slightly spastic especially below umbilicus and in RLQ. No masses felt. Wbc. 12,400, 80% polys. Both knees held in flexed position.	Abdomen full of milky fluid. Ruptured cyst in mesentery of ileum 18" from the ileocecal valve. Bowel slightly congested. Appendix likewise.	Cyst marsupialized to peritoneum and packed with gauze. Appendectomy. Abdomen drained.	Recovered	Ruptured chylous mesenteric cyst.	
(18) Maier	41	M	Sudden onset of constant periumbilical pain. Patient vomited. Pain subsided after morphine administration, but then recurred with previous intensity.	12 hrs. after dinner	Acutely ill. Abdomen boardlike. Slight pain on pressure to left of umbilicus. No air under diaphragm. Wbc. 10,800. Polys 56%. Double mitral rheumatic lesion. Diagnosis:—Perforated ulcer or mesenteric embolus.	Free chyle present in abd. Mesentery of ileum thickened and contained distended lacteals. Ileum likewise showed distended chyle vessels. App. normal. No perforation of gut or stomach; no fat necrosis.	Right rectus incision. Exploration, app. and drainage.	Recovered	Possible obstruction of thoracic duct by rheumatic heart. Questionable rupture of lacteals.	
(19) Stevenson and Frankel	47	F	At 8 A.M. sudden onset of "dreadful faintness" and felt sick. Swelling appeared over left clavicle and extended down to 2nd rib. Was able to eat breakfast later. At 10 P.M. was restless and lost consciousness for ¼ hour. At 10:30 onset of severe abd. pain with maximum tenderness in epigastrium. Admission to hospital the next morning.	Bacon for breakfast, and fat beef for lunch.	Pt. appeared ill and in shock. Abdomen rigid. T. 101, P. 112, R. 24. Swelling above left clavicle had disappeared. Systolic thrill palpable above middle of left clavicle. Continuous murmur. Right radial pulse greater than left. BP (rt) 180/84; (lt) 130/64. No venous distention. Abd. sl. distended, muscles rigid, tenderness most marked in left hypochondrium. Shifting dullness. Wbc. 18,800. Polys 74%. Urea nitrogen 40 mgm.%.	Abdomen contained milky fluid. ¾ pint of pure chyle removed. All organs apparently normal.	Right paramedian incision. Exploratory laparatomy and drainage.	Recovered	Diagnosis made of small arteriovenous aneurysm between left subclavian artery and vein. Rupture of cisterna chyli and/or lacteals. Ingestion of fat.	Murmur and thrill disappeared from near left clavicle. Blood pressures and pulses in each arm equalized. (What happened to aneurysm?)
(20) Hoffman	23	M	RLQ pain of 5 hrs. duration. Onset following fatty meal of beef hash and evaporated milk. Patient vomited after onset and could not contain fluids by mouth. Enema ineffectual.	Hash and evaporated milk for late supper (2 A.M.).	Patient in obvious pain. Legs drawn up on abdomen. Exquisite tenderness in RLQ as well as spasm and rebound tenderness. Tp. 99.8, R. 20. Wbc. 14,000.	Abdomen contained moderate amount free milky fluid. Loop of ileum 1 foot long obstructed by epiploic band. Bowel distended and wall showed white subserosal plaques which could not be wiped off. Mesentery edematous.	Right paramedian incision. Appendectomy, no drainage. Resection of band.	Recovered	Intestinal and lymphatic obstruction due to band.	

(21) Hansen	32	M	Fell on a wheel. In next 6 hrs. developed abdominal pain in LLQ, vomiting. Pt. had been operated on 4 mos. previously and calcified mesenteric glands found.	Not stated.	Abdomen distended, dullness in LLQ. T. 38 C. P. 100.	Intestines matted together, considerable free chyle present. Swelling at root of mesentery with small amount of free chyle exuding.	Abdomen drained	Recovered	Trauma	Tear at root of mesentery.
(22) Karp and Harris	46	F	Tenderness, stiffness and swelling on left side of neck 48 hours prior to admission. This subsided and was replaced by diffuse, crampy abdominal pain which got worse and localized to right side. Appendectomy 19 yrs. previously. Moderate fever and nausea, no vomiting.	Not stated.	Abdomen slightly distended and diffusely tender. Deep palpation able to be carried out on left side, but elicited distinct rigidity and severe pain on the right side. Rbc. 20,800, 87% polys. Chest and flat plate negative. Neck negative. Diagnosis:—Acute cholecystitis and possible perforated ulcer.	Large amount of milky fluid obtained which was spread thruout general peritoneal cavity with local collections beneath liver, spleen and deep in pelvic cavity. Gall bladder and stomach normal. Serosa of upper ascending colon, hepatic flexure, and proximal transverse colon milky white in color as if milk had been injected by fine hypodermic needle. On lateral edge of bowel, the milky fluid appeared to run into fine vessels, but these could not be traced in the mesentery. Small bowel mesentery edematous and contained several inflamed glands. Fluid contained debris and many fat globules. Culture sterile.	Abdomen drained	Recovered	Unknown (involvement of thoracic duct?)	
(23) Reboiras and Giralt	15	M	3-day history beginning with epigastric pain and associated nausea and weakness. After 24 hrs. pain shifted to right iliac fossa and became very sharp. Couldn't work. Vomited several times. Appetite poor and felt listless for two weeks previously.	Not stated.	Abdomen slightly distended. Right-sided muscle spasm and pain especially at McBurney's point. Deep palpation impossible. P. 120/M. Tp. 36.8°C. Rectal examination gave impression of doughy feel on right side. Diagnosis: Acute appendicitis.	McBurney incision. Free milky liquid in peritoneal cavity. Appendix normal. Cecum covered with pearly plaque 5 cm. in diameter at ileocecal angle. Rest of abdomen normal. Abdomen drained. Fluid: aklaline; sterile; s.g.—1,009; contained lymphocytes and abundant fatty granules; albumin, chlorides, and urea present.	Abdomen drained	Did well for 5 days, then began to go downhill. Died 1 mo. and 25 days after onset. Chest plate showed miliary tuberculosis postoperatively. Sputum positive for tuberculosis.	Miliary tbc. Probable tuberculous glands in mediastinum with thoracic duct obstruction.	
(24) Weber	1 mo.	F	Onset with tender abdomen, crying and vomiting. Subsided and then returned several hours later. Stool tinged with red blood.	Breast fed.	Tp. 36°C. Pulse good. Abdomen distended, more painful on right side, tympany in upper abdomen, dullness in flanks suggestive of intraperitoneal fluid. Rectal digital showed blood on examining finger. Diagnosis: Ileocecal intussusception.	Right lateral incision. On opening peritoneum a small jet of white liquid giving the exact appearance of milk was encountered. Ileocecal region normal. Incision enlarged upward and 300 to 400 grams of chylous fluid found. There were 20 cm. of small gut twisted on an abnormally long mesentery which was edematous at the base. Blood and lymph vessels very dilated and base of mesentery contained a pool of chyle.	Involved loop untwisted and placed in right posterolateral position, and sutured to parietal peritoneum.	Recovered	Volvulus of small intestine obstructing chyle vessels.	

bar vertebra to the junction of the left internal jugular and subclavian veins. Its course is along the spinal column, posteriorly, and to the right of the aorta. At its beginning the duct is usually formed by the union of three collecting ducts, one from each lumbar group of nodes and an unpaired intestinal trunk which drains the digestive tract. At the origin of the duct, usually opposite the bodies of the first and second lumbar vertebrae is an elongated dilatation called the cisterna chyli into which all three collecting ducts empty.

Lymphatic fluid is generally a clear colorless liquid as it is received, for example, from the extremities. However, the chyle collected from the digestive tract is a specialized form of lymph inasmuch as it bears the products of fat digestion, and its appearance, particularly at the height of digestion, is milky due to the large number of fatty globules that are being born to the thoracic duct and thence into the blood stream. (As a matter of fact the blood itself on occasion may give this same cloudy appearance when there is an undue number of these fatty globules in the circulation.) It is this milky appearance which should suggest to the observer or the surgeon the possibility that the abdominal fluid is chylous in nature.

A composite analysis of the fluid removed from the abdomen in several of the cases reported gave the following results:

1. Cloudy or milky in appearance.
2. Sterile on culture.
3. Microscopy: large numbers of fat globules, no red blood cells, occasional lymphocytes, few polymorphonuclear leucocytes.
4. Positive fat stain with Sudan III.
5. On standing, the fluid separates into layers, the fatty or creamy layer on top.
6. Alkaline in reaction.
7. Chemical analysis: albumin, chlorides and urea present.

Interestingly enough, an analysis of the protocols of the cases reported in the literature would indicate that several basic findings were common to all. Thus in all cases in which there was presumed to be back pressure within the chyle system with escape of fluid at some vulnerable point there was found, in addition to the free chyle, a varying number of subserosal whitish plaques on the bowel wall, with or without an accompanying rete of fine threadlike capillaries in the bowel serosa. These plaques on first glance gave the impression of a fibrinopurulent exudate. However, they could not be wiped off the bowel, and this maneuver identified them as dilated chyle vessels. In addition, the mesentery associated with the involved portion of bowel was frequently swollen and edematous, and fine white streaks might be seen extending in radial fashion from the bowel. These, no doubt, were secondary collecting vessels running toward the cisterna chyli (findings prominent in the cases of intestinal obstruction and strangulated hernia).

In the cases in which trauma was the etiological factor the tear was invariably at the base of the mesentery overlying the cisterna chyli. There was either free chyle oozing from the tear, or the chyle had seeped between the leaves of the mesentery and produced a large white swelling.

ETIOLOGY

Including the case presentation in this article, a total of 24 instances in which free chyle was found at the time of operation for an acute abdominal emergency was encountered in the literature. The age incidence ranged from 1 month to 65 years, with a preponderance of cases in the third and fourth decades. The patients were predominantly male—17 males to 7 females. An analysis of the causes for the finding of chyle is presented in Table II.

TABLE II.—ETIOLOGY

Unknown		10
Trauma		4
Thoracic duct obstruction		3
a. Due to rheumatism	1	
b. Due to arteriovenous aneurysm	1	
c. Due to tuberculosis	1	
Strangulated scrotal hernia		2
Intestinal obstruction		3
Mesenteric adenitis		1
Ruptured chylous cyst		1
Total cases		24

It will be noted at once that in the greatest number of cases, 10 to be exact, the etiology was unknown. In 6 of these the operation was done because of the preoperative diagnosis of appendicitis, and the typical findings were a normal or slightly enlarged appendix in association with a varying amount of free milky white fluid (which at first led the operator to think of suppuration), and the presence of subserosal white plaques on the bowel wall, along with a varying degree of swelling or white injection of the mesentery. In the 4 other cases, the severity of symptoms and signs led to a preoperative diagnosis of perforated peptic ulcer. The findings, however, were generally the same as just outlined. Next in frequency as a cause was trauma, and this usually produced a tear at the base of the mesentery of the large or small gut presumably involving the cisterna chyli so that free chyle would leak into the abdominal cavity. Four cases fell into this category.

A group of 3 cases comes under one heading. These cases are the ones in which the presumptive thoracic duct obstruction was believed to have produced enough back pressure in the chyle circulation to cause a rupture at some vulnerable point, presumably the cisterna chyli. Of these cases, 1 was produced by tuberculosis (with an eventual fatal outcome through miliary spread), the second was due to thoracic duct obstruction caused by an enlarged rheumatic left auricle with pressure on the thoracic duct, and the third was caused by an arteriovenous aneurysm of the left subclavian vessels. None of these cases was proved by autopsy or other means and the exact diagnosis in each remains conjectural.

There were 2 cases of strangulated scrotal hernias and 3 of small bowel obstruction (2 due to bands and 1 due to volvulus). In all it was only the involved bowel and its mesentery that showed typical findings of chylous obstruction.

One patient had an unusually severe mesenteric adenitis in which it is conceivable that the inflammatory reaction in the intestinal glands produced a localized obstruction to the chyle flow (Davis). In the final case, the surgeon found evidence of a ruptured chyle cyst and he was able to outline its walls.

It is interesting to note that the symptomatology in no less than half of the cases followed more or less directly upon the ingestion of a heavy or a fat-rich meal. Presumably the extra digestive load thrown on the chyle circulation was enough to produce an extravasation of chyle or rupture of the chyle vessels at some vulnerable point. This is particularly likely in the instances of unknown etiology and no doubt played an important role when a pathological condition was already present, such as intestinal obstruction or trauma.

Some light is thrown on the subject by the experimental work of Lee (64, 65). While attempting to produce chylous cysts in animals, he noted that although the production of a high degree of lymphatic pressure plus obstruction of the lymph flow did not lead to cyst formation, rupture of a small lymph vessel was observed in 3 animals. He likewise noted the relative ease with which carbon particles could traverse the wall of a lymph vessel without causing rupture of that vessel. In experiments on cats he found that ligation of the thoracic duct in the chest produced an extravasation of chyle, first in the region of the cisterna chyli and then spreading retroperitoneally and into the leaves of the mesentery. At the end of 72 hours much of the extravasated chyle had already been absorbed, and it was rare for any trace to remain longer than 144 hours. Usually a small amount of chylous ascites was present at the end of 24 hours after duct ligation, but at 48 hours it was rarely possible to aspirate any more chylous fluid from the peritoneal cavity.

These experiments indicate at least one mode of production of an acute chylous effusion, namely, thoracic duct obstruction. Perhaps some such mechanism was responsible for the cases of unknown etiology despite the fact that clinical indications of such obstruction were lacking.

DISCUSSION

We return now to the questions posed at the beginning of this article: What is the real cause of the acute abdomen? What part did the chyle play in the symptomatology? What is the best procedure for handling the case?

The cause of the acute abdomen. When an obvious etiology exists, i.e., trauma or intestinal obstruction, there is no problem. The cases wherein a cause is suggested, such as arteriovenous aneurysm, tuberculous thoracic duct obstruction, or pressure of an enlarged rheumatic left auricle upon the thoracic duct, raise considerable doubt as to the actual sequence of events. Certainly there should be many more such cases if tuberculosis or rheumatic heart disease is held to play a part. And in the case of the postulated arteriovenous aneurysm, the prompt disappearance of the mass in the neck makes one wonder what suddenly happened to the aneurysm.

The cases in which the etiology is listed as unknown are interesting because in a good proportion of them, a heavy or fatty meal was ingested shortly before the onset of the disease. Presumably this had some bearing on the sequence of events, particularly when the existence of a vulnerable point in the chyle circulation is presupposed. However, the question may again be raised as to why this condition does not occur more frequently inasmuch as overeating is a popular pastime everywhere.

In summation, it may be said that the etiology is unknown in most cases, that a point of obstruction to the chyle flow or weakened integrity of the chyle vessels exists, and that, perhaps under the influence of an extra load on the digestive apparatus, a leak of chyle may occur.

The relationship of chyle to the symptomatology. Just as blood in the abdominal cavity acts as a painful irritant, so, apparently, does chyle appear to act, perhaps in even greater degree. The violence of the onset and symptoms led to a diagnosis of perforated ulcer in 4 of the patients, and one of acute appendicitis in 6 of the patients. Perusing the case protocols, one is impressed with

the severity of these complaints and the universally associated findings of muscle spasm, rebound tenderness, and pain on palpation. Likewise in the cases in which the etiology was known, the associated symptoms and signs produced by the presence of free chyle were very impressive. In the author's own case, the attitude of the patient—knees drawn up—and the exquisite abdominal tenderness on palpation, led him to diagnose the presence of an acute abdomen, possibly even rupture of the suspected viscus.

We must therefore conclude that chyle outside of its own retaining vessels is a noxious substance which can produce a peritoneal irritation mimicking exactly an otherwise inflamed peritoneum.

How to manage the case. Obviously, it is practically impossible to find a break in the continuity of the chyle system which involves such an extensive circulation, let alone to undertake a repair. Fortunately, in all but 1 of the cases it did not seem to matter. Once the offending pathology was apprehended and corrected, the patient was apparently on his way to recovery. The removal of most of the irritant chyle and the postoperative phase of lowered food intake allowed the leak to seal itself, and whatever obstruction was present to subside (especially in the cases of unknown etiology). Perhaps collateral channels of chyle flow helped take the load off the system following the operation.

To drain or not to drain did not appear to matter except when trauma had produced a rent in the cisterna chyli. The 1 patient who died (Papenberg's) was apparently moribund when operated upon. The sequence of peritonitis, paralytic ileus, and death in this case was believed to result from the action of the free chyle. An accompanying appendectomy (for want of anything else to do, no doubt), when a cause could not be found, did not influence the morbidity rate or result in mortality. In short, the surgeon eliminated the pathology when he found it; when he could not find a cause, he removed the chyle, sometimes draining the abdomen, sometimes not (especially if he was operating in the right upper quadrant); in all cases the patient recovered without recurrence. One patient died, perhaps the result of delayed operation.

SUMMARY

1. A case of small bowel obstruction with free chyle in the peritoneal cavity is described.

2. A review of the literature produced 23 other cases of free chyle in the acute abdomen.

3. The special features found in these cases are described along with a discussion of the methods of managing the individual case.

4. The findings that should enable the surgeon to recognize involvement of the chyle system are given.

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ABSTRACTS OF CURRENT LITERATURE

SURGERY OF THE HEAD AND NECK

HEAD

The Diagnosis of Maxillofacial Injuries (Diagnóstico das lesões traumáticas do macisso ósseo facial). A. M. BAPTISTA FERNANDES. *Rev. Port. med. Mil.*, 1953, 1: 101.

In addition to maxillofacial injuries, the author discusses associated fractures involving the mandible, zygoma, orbit, antrum, nasal bones, and ear canal. Immediate, precise, and thorough examination is mandatory to prevent complications such as difficult or obstructed deglutition, respiratory disorders, auditory involvement, orbital aneurysms, malocclusion, facial disfigurement, osteomyelitis, and pseudarthrosis. Inspection and methodical palpation by digital oral exploration are followed by roentgenography from various angles—nasofrontal, lateral, lateral oblique (30 degrees), and lateral oblique with head rotation. In addition, tomograms of the mandibular joint coaptation are taken.

In reviewing the more frequent sites for fractures of the facial bones, the author follows MacIndoe's nomenclature, illustrating it amply with diagrams and figures. MIGUEL DROBINSKY, M.D.

EYE

Trauma to the Eye. A. D. RUEDEMANN. *Surg. Clin. N. America*, 1953, 33: 1105.

This is a concise, well organized article on all types of injuries to the eye.

In the introduction the author gives the causes of injuries—chemical or mechanical, hot or cold, force or without force—and gives special attention to the history, careful examination, and complete record of the injury. First aid and the original treatment is of importance. The following injuries are discussed:

1. Superficial foreign bodies, which should be removed with a single maneuver and with as little trauma as possible.

2. Intraocular foreign bodies.

3. Chemical and other burns such as those from acids, alkalis, match heads, firecrackers, and molten metal.

4. Lacerations of the cornea:

Direct suturing of the cornea is preferred to conjunctival flaps. A flap should be used for possible prolapse of the iris with fistula.

Rupture of the globe extending through the ciliary body is extremely dangerous and enucleation is usually necessary.

5. Contusions of the eye. This is usually associated with retinal damage or separation, lens dislocation, or global rupture.

6. Injury to the eyebrow.

7. Injury to the eyelids. Repair to this type of injury is very important and a knowledge of plastic surgery is important. The levator should be inspected and repaired if necessary. Injuries to the puncta and lacrimal sac are very important and repair should be done at the time of injury if possible. The torn ends of the canal should be found and threaded on a tubing of vinylite. Suturing then secures them.

8. Injuries to the bony orbit. The zygomatic process is most frequently fractured and the lower rim or floor of the orbit is damaged. Good placement is essential with secondary packing of the antrum.

EARL H. MERZ, M.D.

Toxoplasmosis in the Adult. SIR STEWART DUKE-ELDER, NORMAN ASHTON, and M. BRIHAYE-VAN GEERTRUYDEN. *Brit. J. Ophth.*, 1953, 37: 321.

As a congenital clinical entity, this condition is well established but little is known of toxoplasmosis acquired in childhood or in adult life.

A cytoplasm-modifying dye test used to determine the levels of positive titres may be regarded as significant. The titres do not exceed 1 to 64 in the vast majority of the normal population.

In regard to the complement-fixation tests, titres as low as 1 to 2 can be specific. The complement-fixing antibody appears later and disappears earlier than the cytoplasm-modifying antibody. Rabbit skin tests and the dermal sensitivity tests are confirmatory.

Serological results are regarded as significant, and, when taken in conjunction with the histologic finding, there can be little doubt that the granulomatous chorioretinitis was toxoplasmic in origin.

A case of recurrent granulomatous chorioretinitis in an adult is reported, and the clinical, histologic, and serologic evidence for regarding the condition as due to toxoplasmosis is presented.

The findings in this case support the opinion of Wilder (1952) that, in adults, granulomatous chorioretinitis clinically and histologically resembling tuberculosis may be due to toxoplasmosis. Wilder demonstrated protozoa in 53 cases. This suggests that toxoplasmosis may be a not uncommon cause of chorioretinitis in adults.

When sections were examined to ascertain whether a similar high incidence is to be expected in Great Britain, none of the 32 cases presented the localized type of necrotic lesion described by Wilder as typical of toxoplasmosis.

In the case reported, the authors concluded that the disease was congenital, or had been acquired in

childhood, and the active chorioretinitis in adult life was attributed to a recrudescence of the early infection.

About 50 per cent of sections of 32 cases of granulomatous uveitis examined showed structures resembling Toxoplasma forms; however, in some of these cases, which included posttraumatic uveitis and Behcet's syndrome, the diagnosis of toxoplasmosis would have been highly improbable.

There is as yet no certain evidence to show that the case reported here is other than a rarity.

JOSHUA ZUCKERMAN, M.D.

Treatment of Corneal Infection with Pseudomonas Pyocyanea by Subconjunctival Injection of Polymyxin E. D. AINSLIE. *Brit. J. Ophth.*, 1953, 37: 336.

In man, this type of ocular infection runs an unusually serious course, and it is resistant to the methods of treatment—including the antibiotics—hitherto employed clinically. This behavior is in contrast with satisfactory results obtained in animals.

Polymyxin E was prepared for injection by dissolving the contents of one vial of 1,000,000 units in 1 ml. of an aqueous solvent consisting of mydricaine, 0.5 ml., and sterile distilled water, 0.5 ml., allowing a half hour for the polymyxin to dissolve. The dosage is 0.20 to 25 ml. (200,000 to 250,000 units). The solution remains stable for a week.

Ainslie treated 6 patients with proved corneal infection by Pseudomonas pyocyanea, and 2 patients who presented the clinical features of such infection, but without cultural confirmation.

In all of the cases, the pupils were fully dilated with atropine and the eyes patched throughout the period of the injections.

The first patient presented an ulcer involving almost the entire cornea, extensive infiltration, hypopyon which filled more than half the anterior chamber, chemosis, and 2 mm. of proptosis. In this case, infection could not be more than temporarily controlled, although 13 daily subconjunctival injections of 200,000 units of polymyxin E were administered.

In 5 of the 6 patients with proved pyocyaneus ulceration, all of whom appeared to be progressing toward loss of the eye, the infection was overcome by subconjunctival injections of polymyxin.

Two patients in whom the corneal infection was diagnosed as due to Pseudomonas pyocyanea, on clinical grounds alone, were cured.

In 2 cases the infection recurred after cessation of the first course of treatment, but was brought under control again by a second course. It is therefore recommended that treatment should always be continued for several days after the clinical appearance indicates that the infection has been overcome.

Despite its powerful activity against the Gram-negative bacilli, polymyxin is completely ineffective against the cocci. For that reason the conjunctival sac must be kept as free as possible of these organisms during treatment, by the use of aureomycin, chloramphenicol, or terramycin ointment.

Danger of secondary infection is not so great when the Gram-negative infection is treated with streptomycin. This antibiotic is also effective against most coccal organisms. Gram-negative organisms, however, are usually found to be more sensitive to polymyxin than to streptomycin.

In 4 of the cases, streptomycin had been applied by subconjunctival injection before polymyxin was tried. In 2 cases, temporary improvement followed streptomycin therapy, but in the other 2 cases it produced no change. Immediate improvement followed the use of polymyxin injections in all cases.

JOSHUA ZUCKERMAN, M.D.

Use of Specific Streptococcus Vaccine in Nongranulomatous Uveitis. ALAN C. WOODS. *Arch. Ophth.*, Chic., 1953, 50: 129.

A study of 208 patients with uveitis at the Wilmer Ophthalmological Institute demonstrated the value of intracutaneous tests with streptococcus antigens in the detection of specific bacterial hypersensitivity, as well as the value of intravenous desensitization with the incriminated organism in the therapy of the nongranulomatous type. In this type the surgical eradication of foci of infection may bring the attack to an end, but very often it is without effect. Therapy with adrenal cortex hormones controls the inflammatory symptoms in 80 per cent of patients but does not prevent recurrences.

A specific bacterial hypersensitivity was observed in 89 per cent of patients with nongranulomatous uveitis and in only 20 per cent of those with granulomatous uveitis. Generally, the sensitivity was to various strains of streptococci. the most important of which was subgroup A of the beta streptococcus strain. Foci of infection were associated with the nongranulomatous type twice as frequently as with the granulomatous form. The intravenous administration of a specific streptococcus vaccine in nongranulomatous uveitis gave a successful result in 80 per cent of patients who were adequately treated. Success was demonstrated by achieving desensitization and a remission of further attacks of uveitis.

The cumulative evidence that patients with nongranulomatous uveitis have a higher incidence of specific bacterial hypersensitivity, a higher incidence of foci of infection, a low incidence of systemic granulomatous disease, and that they tend to recover by specific desensitization, all confirm the hypothesis that nongranulomatous uveitis is a bacterial allergic reaction. JAMES E. LEBENSOHN, M.D.

The Effect of Adrenal Cortex Hormonal Therapy on Experimental Brucella Uveitis. RONALD M. WOOD, BERNARD BECKER, and ALAN C. WOODS. *Am. J. Ophth.*, 1953, 36: 1025.

This article is the result of an experiment to determine if adrenal cortex hormones exert a favorable or

unfavorable effect on experimental nontuberculous granulomatous uveitis.

In tuberculous rabbits, treatment with these hormones changed a restrained ocular tuberculosis to a fulminating destructive type of disease which is seen in normal nonimmune animals.

In other cases of granulomatous uveitis an unfavorable course was noted after hormone therapy. Therefore, Brucella organisms were selected to be treated by the hormones.

The results of the experiment showed that hormonal therapy in rabbits caused the Brucella uveitis to be more severe and of longer duration. It may at times postpone the outbreak of the disease. However, it is also probable that during this period the organisms continue to propagate and later produce more severe reactions. EARL H. MERZ, M.D.

Use of Hydrocortisone (Hydrocortone) Acetate in Ophthalmology. JOSEPH LAVAL. *Arch. Ophth.*, Chic., 1953, 50: 299.

Hydrocortisone acetate (Compound F) is a milky suspension, similar in appearance to cortisone acetate. It may be given subconjunctivally or in the form of eye drops, but not by mouth or intramuscularly because it is much less efficacious than cortisone when administered by the two latter routes. When administered subconjunctivally, or as eye drops, hydrocortisone is superior to cortisone and may be helpful in cases in which cortisone and corticotrophin (ACTH) are ineffective.

For use as drops, a 0.5 per cent solution is made by mixing 1 c.c. in 3 c.c. of a suitable diluent. For subconjunctival injections, 0.5 c.c. of the drug is administered directly from the vial every 6 or 7 days. Cortisone acetate may be taken simultaneously by mouth in doses of 25 mgm. every 4 hours.

Steffenson is quoted as stating that 2 cases were reported in which subconjunctival injection of hydrocortisone was very effective, that it was difficult to judge the relative merits of cortisone and hydrocortisone clinically, but that it is his impression that the action of hydrocortisone is slightly superior to that of cortisone.

The use of hydrocortisone as drops or by subconjunctival injections is advocated especially in those cases in which improvement with cortisone is slow, or is very poor. JOSHUA ZUCKERMAN, M.D.

NOSE AND SINUSES

Sinusitis as a Focus of Infection in Uveitis, Keratitis, and Retrobulbar Neuritis. FRANCIS L. WEILLE and ROLF R. VANG. *Arch. Otolar.*, Chic., 1953, 58: 154.

The theoretical basis for focal infection involves one of the following assumptions in the etiological relationship between the focus of infection and the secondary disease: (1) toxemia; (2) lymphangitis; (3) bacteriemia; (4) reflex relationships; (5) direct extension of the infection into adjacent structures (in the case of sinusitis).

The whole theory of focal infection has been subject to criticism by many workers because: (1) a large group of normal people have foci of infection without ill effects; (2) there is an absence of cure in a great many people from whom a focal infection is removed; (3) most of the supporting data for the focal infection theory consist of isolated cases and there has been no genuine evidence of secondary phenomena from the foci, such as bacteriemia.

It has been shown that all pathological bacteria are capable of producing tuberculin type reactions in certain eye tissues, which will act as shock organs to further exposure; however, the beneficial effect of typhoid vaccine in uveitis may be from a release of cortisone through a stress reaction rather than actual desensitization.

In spite of this evidence, most reputable eye surgeons believe that there may be a relationship of focal infection to certain types of eye disease such as uveitis, keratitis and, occasionally, retrobulbar neuritis; also, that in the majority of cases the focal infection is from infected teeth, tonsils, or prostates, and only rarely from sinusitis.

The authors' case against sinusitis as a cause of secondary eye disease is that no toxemia, lymphangitis, or bacteriemia can be demonstrated except during the acute stage of sinusitis when there are retained secretions under pressure. Nasal reflexes may possibly exist in relation to the eye, but their potentiality for producing eye disease is very doubtful, and direct extension of a sinusitis into the orbit, while it does occur, rarely results in a retrobulbar neuritis.

Numerous statistics from clinical material are available. In 427 cases of uveitis in which a search for a focal infection was made, sinusitis was the only possible focus in only 11 per cent of the cases. Only 9 per cent of the cases of keratitis studied showed a possible focus of infection solely in the sinuses. In the Eye Department at the Massachusetts Eye and Ear Infirmary, sunus infections are not considered at all important in this disease. In retrobulbar neuritis, anatomical studies on 171 skulls showed a very high incidence of dehiscences in the posterior ethmoid cells and sphenoid sinus in relation to the optic nerve. In spite of this high incidence of dehiscences, retrobulbar neuritis is an uncommon disease. Among 48 cases of retrobulbar neuritis, sinusitis was found in only 13 per cent and in only one of these patients was there extension of the infection into the orbit as an obvious cause of the disease.

The authors believe that sinusitis, if present with keratitis, uveitis, or retrobulbar neuritis, should be treated on the basis of its own severity, either medically or surgically; only as a last resort should an attempt be made to eradicate sinus disease to cure eye disease, and then only when the patient fully understands that such therapy only occasionally is useful as far as remission of the eye disease is concerned. In particular, they consider that drastic sinus surgery should be avoided in the presence of minor sinus involvement.

WILLIAM K. WRIGHT, M.D.

NECK

Radioactive Phosphorus as Indicator in a Chick Assay of Thyrotropic Hormone. BROR-AXEL LAMBERG. *Acta med. scand.*, 1953, Supp. 279.

After a general discussion of the methods previously used for the assay of thyrotropic hormone, the author describes a method for the assay of small amounts of this substance, using P^{32} (radioactive phosphorus) as an indicator and 1 to 3 day old white Leghorn chicks as experimental animals. Thyroid activity was measured by the uptake (counts/min./mgm. tissue) of P^{32} by the thyroid 60 minutes after the subcutaneous injection of 2 to 12 uc. of P^{32}. Two Ambinon powders were used as thyrotropic preparations, and the increase in thyroid function was regarded as the ratio of P^{32} uptake in treated animals to P^{32} uptake in untreated controls. A parallel-line assay with a standard preparation was essential, as variations between different broods made it impossible to establish a fixed chick unit or a standard dose-response curve. Various aspects of this assay are compared and contrasted critically with existing assay methods for thyrotropic hormone, and it is concluded that "P^{32} is an adequate indicator of thyroid activity in the assay of small amounts of thyrotropic hormone using young chicks, and that this method might perhaps be used for the titration of thyrotropic hormone in human physiology and pathology." L. R. C. AGNEW, M.D.

Carotid Body Tumors. H. MASON MORFIT, HENRY SWAN, ELLIS R. TAYLOR. *Arch. Surg.*, 1953, 67: 194.

The authors offer the opinion that: first, carotid body tumors are not totally benign; second, it is possible to remove them without disrupting arterial continuity; and third, if the artery is damaged continuity can and should be restored.

The diagnosis is discussed. The presence of a tumor in the neck is the most common symptom and sign. Other symptoms follow as the mass enlarges and spreads. Fixation of the tumor so as to permit lateral but not vertical motion of it is not considered pathognomonic. Aspiration biopsy is believed to be of considerable aid in diagnosis. Surgical exploration eventually solves the problem.

The risks of carotid artery ligation are discussed. It is believed that the risks are great and that they entail fatal, crippling, and very undesirable sequelae; therefore, ligation of the carotid artery should not be done without restoration of arterial continuity.

Opinions vary as to the possibility of carotid body tumors being malignant. Evidence of distant dissemination is not often found. Local recurrence may be so extensive as to cause death when it is removed, the result being the same as if the tumor were malignant. A partial survey of the local recurrence of such growths reported in the literature is presented. There were 7 cases and death resulted in all of them. Distant dissemination is rarer, but occurs. One of the patients in the authors' series had distant lymph node involvement. Instances of extension to the liver, bones, kidney, and pancreas have been reported, usually as single case reports.

Surgical removal of these tumors is advocated and may be done without arterial damage. This may be accomplished by dissecting off the adventitia of the vessels with the tumor, thereby having a good line of cleavage for safe dissection. If the vessels are damaged, the damage should be repaired by suture or arterial anastomosis.

Twelve cases of carotid body tumors are presented. The tumors were removed in all but one instance. In 8 of the remaining 11 cases, removal without arterial damage was accomplished. Vessel ligation was needed in 3 patients, but no permanent sequelae followed; local recurrence associated with distant dissemination and death occurred in 1 case. Follow-up studies cover a period of a few months to 14 years. DONALD C. GEIST, M.D.

Carcinoma of the Thyroid. HODGE N. CRABTREE and DANIEL C. HUNTER, JR. *Arch. Surg.*, 1953, 67: 175.

A review of 1,928 consecutive thyroidectomies at the University of Michigan Hospital from 1935 to 1950 revealed 145 instances of malignant disease of the thyroid gland. This group of patients was reviewed with special attention to the age of the patient, the histopathology of the tumor, and cervical lymph gland metastases as prognostic signs.

Six patients in this group had secondary malignant disease of the thyroid and are considered separately. The remaining 139 patients represented a 7.21 per cent incidence of cancer in the total series of thyroidectomies. The patients were grouped as follows:

Group I consisted of 37 patients with early carcinoma within an adenoma, but definitely malignant. Group II consisted of 31 patients who had carcinoma in an adenoma with early infiltration of the capsule of the adenoma. Group III included the patients with advanced carcinomas. There were 66 patients in this group—3.42 per cent of the entire series of thyroidectomies. Five patients had sarcoma of the thyroid gland.

Of 1,455 nodular goiters, 131 (9%) contained carcinoma. Twenty-four per cent of the carcinomas were in glands with a single nodule, and 7.54 per cent were in multiple nodular goiters. The disease appeared more often in females. Forty per cent of the patients were under 40 years of age and 11 were under 20 years of age.

In the early cases (Groups I and II), the cells were well differentiated—65 per cent being adenocarcinomatous, 20 per cent papilliferous, and 12 per cent hypernephroid. The remaining 3 per cent were mixtures of cell types. Only nine of the sixty-eight patients with early carcinoma have died; 44 patients have survived a 5 year period. Seventeen of the 44 patients have lived more than 10 years and 8 others more than 15 years after operation.

Group III included 23 patients with papilliferous adenocarcinomas. Two patients died—8.7 per cent of this group. Nine have survived 5 years or more

and 3 have had cervical recurrences. Of the remaining 43 patients in Group III, 20 died of cancer of the thyroid, the majority in the first year after operation. Of 17 living patients, 10 had at least one recurrence. Only 6 of the 17 survived 5 years, and only 1 of the 6 survived for 10 years. All of the patients with sarcoma died within 1 year after operation.

Recurrence was more frequent in these patients with cervical node metastases. Early removal, as was done in the first two groups, offers the best prognosis. Cancer in the younger age group presented a better outlook. If the diagnosis was quite apparent clinically, the outlook was poor. Metastases beyond the cervical nodes made the result hopeless. Therapy is briefly discussed in general. Radical neck dissection is not considered necessary in most instances. DONALD C. GEIST, M.D.

The Incidence and Surgical Treatment of Carcinoma in Adenomatous Goiter. J. WILLIAM HINTON and LOUIS R. SLATTERY. *Surg. Clin. N. America*, 1953, 33: 351.

The association of nodular goiter and thyroid carcinoma was long ago pointed out by Ehrhardt in 1902, by Allen Graham in 1924, and strongly emphasized in recent years by Ward, Cole and his coworkers, and by Hinton and Lord. Also, a higher rate of cancer in nodular goiter is noted in central parts of the country as compared to the seaboards. Also, the incidence of thyroid carcinoma seems to remain constant in two series of the authors' own material, 7.2 per cent and 7.6 per cent, and also in reports by Cole and by Beahrs and Pemberton. Most authors agree that the highest incidence of carcinoma occurs in the single nontoxic nodule. However, there is an increasing tendency to regard the possibility of carcinoma in multinodular goiters with slightly less suspicion since some clinics and also the authors find that single nodules upon physical examination are found to present multiple nodules at operation. The incidence of cancer in single and multinodular nontoxic goiters is high enough to warrant thyroidectomy unless a serious contraindication exists.

The clinical data pertaining to the 19 carcinomas found among 262 nontoxic nodular goiters are similar to those of other authors. Women predominate among the patients because nodular goiter is more frequent in women, so that the percentage incidence of cancer in nodular goiter is actually higher in men. Although most of the patients with thyroid cancer are in middle life, some are at each extreme of life, and the investigation of thyroid nodules in children is considered of great importance. The duration of malignant lesions varies from their detection upon a routine physical examination to their known existence for decades. There is also no relationship to the size. Even recent enlargement has proved of little significance. Crile has reported carcinomas of low grade malignancy remaining the same size for years. Thus, observations by highly qualified observers attest to the lack of criteria which reveal the probability of malignant degeneration in nontoxic nodular goiter.

For the solitary nodular goiter not yet broken through its capsule and invading the lymphatics, in accordance with Allen Graham's observations, it appears sufficient to excise totally the involved lobe and the adjacent isthmus. This procedure should be adequate also for the clinically unsuspected lesion discovered by the pathologist. Most surgeons also favor complete lobectomy and removal of the isthmus for the solitary nodule. Enucleation of the nodule for pathologic diagnosis may seed the operative field with cancer. Search for involvement of the node just above the isthmus, of the delphian node of Cope, and of the preisthmic node before excision of the nodule may be helpful. Even in multinodular goiter a subtotal resection leaves abnormal tissue behind. The lobe remaining after a hemithyroidectomy may enlarge by thyrotropic pituitary stimulation unless the metabolism is maintained at a normal level with desiccated thyroid.

Complete lobectomy for a solitary nodule must be done without damage to the recurrent nerve or parathyroids. Manipulation of the gland with hemostats applied near each pole is preferred to sharp, hooked instruments which may rupture its capsule. Exposure of the recurrent nerve and parathyroids is essential in total lobe removal. The thyroid gland is exposed with or without transverse division of the strap muscles through their upper third. After division of the middle thyroid vein, the superior thyroid vessels are ligated. The superior pole is then turned down by separation of its medial and posterior fascial attachments to the larynx. The inferior thyroid artery is then exposed by retracting the carotid sheath. This artery is traced to the gland where its relationship to the recurrent nerve and parathyroids is identified. The artery or its branches just beneath the lobe are then divided so that the nerve and parathyroids can be dropped back into their posterior position. The nerve and parathyroids remain in view during the remainder of the procedure. The inferior thyroid veins are then divided. The dissection is carried medially and upward across the trachea until the isthmus and the lobe have been removed.
DAVID MOVITZ, M.D.

Thyroidectomy: A Review of 1,000 Consecutive Cases. M. J. LANGE. *Brit. J. Surg.*, 1953, 40: 544.

One thousand unselected consecutive thyroidectomies are reviewed. The low morbidity and mortality rates vindicate this unit's tenet that, with occasional exceptions, surgery remains the treatment of choice of goiter. It is freely admitted that the advent of radioactive iodine may modify this view in relation to the toxic goiter. The elderly patient with myocardial damage, little cardiac reserve, and a goiter that would be difficult to remove is now being considered for treatment with I^{131} (radioiodine), provided there are no severe pressure symptoms which would make

surgery obligatory. Another category which merits consideration for I^{131} therapy is the recurrent case in which operative difficulties are anticipated. The operability rate is over 99 per cent.

Principles in technique are suggested which, it is believed, will reduce the incidence of recurrences to negligible proportions. Figures are produced which indicate a high incidence of cardiac damage in goiter. W. FOSTER MONTGOMERY, M.D.

Asthenia Accompanying Hyperparathyroidism (L'asthénie dans l'hyperparathyroidie). J. MORELLE, P. DE WITTE, and P. WELLENS. *Acta. chir. belg.*, 1953, 52: 582.

In addition to the classical osseous form of hyperparathyroidism there is a renal type which is characterized by the formation of calculi and arterial hypertension. Less frequently a digestive syndrome, whose real origin is difficult to detect, is produced. Recalcification of bones in such types may be attenuated to such a degree that only the humoral syndrome leads to a correct diagnosis.

The symptomatology of hyperparathyroidism may be divided into 3 groups: (1) hypercalcemia, responsible for asthenia, chronic constipation, vomiting, lassitude, cardiac arrhythmia and slow pulse; (2) signs produced by involvement of the osseous system, such as pains in the bones and articulations, spontaneous fractures or deformities, (3) renal calculi, polyuria, or polydypsia.

The development of hyperparathyroidism is very slow, and much time passes between the onset of the condition and the early osseous manifestations. Symptoms observed in patients who have no apparent renal or osseous lesions are attributable to anomalies of concentration of electrolytes.

A woman, aged 37 years, who had been complaining for 11 years of a variety of symptoms interpreted as neuropathy, fell and sustained a fracture of the surgical neck of the humerus. Roentgenograms revealed a cyst within the bone. Further examination established the diagnosis of hyperparathyroidism. After extirpation of a parathyroid adenoma extreme asthenia, which had been dominating the clinical picture before the operation, rapidly disappeared. Pains in the bones as well as hypercalcemia promptly subsided and the patient felt "completely transformed." JOSEPH K. NARAT, M.D.

SURGERY OF THE NERVOUS SYSTEM

BRAIN AND ITS COVERINGS; CRANIAL NERVES

Arteriovenous Malformations of the Head. JOHN GILLINGHAM. *Edinburgh M. J.*, 1953, 60: 305.

The author discusses the symptomatology, the morphology, the diagnosis, and the treatment of arteriovenous malformations. The discussion is based on experiences with 18 patients. The initial symptom in 10 patients was spontaneous intracranial hemorrhage, in 6 patients, epileptic convulsions, in 1 patient, obstructive hydrocephalus and in another, migraine. In 6 patients the lesion was accessible and was treated by excision, and in 1 patient with obstruction of the aqueduct by a malformation of the midbrain, the treatment consisted of ventriculocisternostomy. Of these 7 patients, 5 remained alive. Operation was withheld in 13 cases because the lesion was considered inaccessible. Of these patients, 12 remained alive and 1 died 2½ years after investigation of an overwhelming intracranial hemorrhage.

These arteriovenous lesions may be quite small or they may be enormous. Occasionally they may be multiple. They are usually found within the cerebral hemispheres and present the appearance of an area of tangled, pulsating blood vessels on the surface of the cortex associated with an underlying, more compact spongy mass of vessels in the deeper parts of the cortex and the white matter. This compact spongy mass is often wedge-shaped with its apex directed centrally toward the ventricle. The ventricular wall itself may be partly made up of tortuous vessels pouting into the cavity. The distended, ill-formed vessels have thin, friable walls and have a tendency to enlarge by progressive distention into aneurysmal sacs which sometimes occupy considerable space within the brain and may be so placed as to obstruct part of the ventricular system, giving rise to increased intracranial pressure. The hemorrhage associated with an arteriovenous malformation is often minor and is more often intraventricular rather than subarachnoid. They are only very rarely associated with a vascular bruit. Occasional vascular contributions from the external carotid system may be present. The feeding vessels of the malformation are enlarged and tortuous. Occasionally the carotid vessels within the neck and skull may also be abnormal in size. It seems that ischemia or slowing of the circulation to the normal brain of the involved cerebral hemisphere may be responsible for some of the patient's symptoms.

The author discusses the differential diagnosis between different origins of intracranial hemorrhages. Arteriovenous malformations are characterized by minor and recurrent episodes of so-called subarachnoid bleeding associated with Jacksonian epilepsy, and occasionally are accompanied by an intracranial bruit or a pulsating swelling of the skull. Cerebral angiography is essential for an accurate diagnosis and for localization of the lesion. These lesions do not respond to deep x-ray therapy. Complete surgical excision of the lesion is the therapy of choice. Partial excision is unsatisfactory, as recurrent hemorrhage may arise.

The article is accompanied by 30 excellent photographs, but little mention is made of the literature.

GEORGE PERRET, M.D.

Cerebral, Cirsoid, and Arteriovenous Aneurysms. Anatomical, Clinical, and Radiological Considerations of 19 Cases (Anévrismes cirsoïdes et anévrismes artério-veineux de l'encéphale d'après dix-neuf cas; considérations anatomiques, cliniques et radiologiques. D. PETIT-DUTAILLIS, G. GUIOT, and H. BERDET. *Presse méd.*, 1953, 61: 901.

The authors consider cirsoid aneurysms and arteriovenous aneurysms as pseudotumors or vascular malformations because they do not contain capillaries or growing elements which would differentiate them from true tumors such as angiomas. The arteriovenous aneurysm is characterized by one or numerous arteriovenous shunts, well localized, which are sometimes made up of a large number of abnormal arterioles, or a telangiectasis, that drain directly in one or more veins. Of the 18 arteriovenous malformations described, 2 were found in the posterior fossa and the other 16 were supratentorial. The supratentorial aneurysms included 9 cirsoid aneurysms and 9 arteriovenous aneurysms. From a histologic point of view they distinguished three types:

1. The type in which the tumor was formed by an agglomeration of dilated vessels composed mostly of well formed arteries, the walls of which were rather irregular, contained some collagen and showed occasional dehiscence with interstitial hemorrhages.

2. The type in which the dilated vessels could not be established as to their arterial or venous nature, but their walls were thickened and made up almost altogether of collagen and even hyalin. They contained diverticula and even voluminous pockets which formed the principal mass of the aneurysm.

3. A mass of arterial vessels and venous vessels together with a mass of dilated vessels, the walls of which were thickened and made of collagen and hyalin.

Thromboses were frequent in all three types and capillaries were absent most of the time.

The first clinical symptoms produced by these malformations were most commonly meningeal or cerebromeningeal hemorrhages accompanied by headaches and vomiting. Four cases started with epileptic convulsions. Less commonly, some patients developed exophthalmos on the side of the

lesion. The abnormal vascular bruit was detected only in 1 patient who was an infant. These tumors were as common in females as in males and were more common in young people.

In simple roentgenograms of the skull, calcifications were only rarely seen although the calcifications may be more common in the histologic preparation. The diagnosis of these lesions is made by arteriography. The cirsoid aneurysm shows a well outlined picture of an ovoid or quadrangular mass with one or several efferent veins. The arteriovenous aneurysm is characterized in the arterial stage of the angiogram by a tortuous artery and a cerebral vein well localized and associated with a small vascular shadow which is produced by the arterioles at the site of the shunt.

The treatment of these malformations will be discussed in a later article. GEORGE PERRET, M.D.

Operative Management of Severe Occipital Neuralgia (Operative Behandlung der schweren Occipital-Neuralgien). R. WANKE and E. BUES. *Chirurg*, 1953, 24: 306.

Specific therapeutic considerations arise in the management of pure occipital nerve neuralgia from the anatomic and topographic relationships of the cervical spine. The first cervical root is without practical significance in this neuralgia since its sensory component is rudimentary. In contrast, the sensory component of the second cervical nerve shows a pronounced development, and its roots form the occipitalis major and, in part, the occipitalis minor. The roots of the second cervical, like those of the first cervical nerve, extend dorsally through a membrane in contrast to the anatomic relationship which exists between the lower cervical roots and the intervertebral foramina; thus the former are not as subject to compression by bone as are the lower roots. The roots of the third cervical nerve contribute to the occipitalis minor and auricularis magnus and are of little significance with respect to the clinical entity of pure occipital nerve neuralgia. The roots of the third cervical nerve are the uppermost roots bearing the same general topographic relationship of the remaining cervical roots to the vertebrae, and innervate only a relatively small area adjacent to the lower half of the ear.

On anatomic and topographic considerations, the mechanisms leading to root compression in the middle and lower cervical spine should not be regarded as etiologic factors in pure occipital neuralgia. In the latter condition little is to be expected from therapy directed to the cervical spine, but rather the therapeutic approach should be directed more centrally.

The author reports 6 cases in which the sensory roots of the second and third cervical nerves were sectioned intradurally. Severe occipital neuralgia and its accompanying vertigo, nausea, and vomiting completely disappeared following intradural root section. The average follow-up period of observation was 6 months. The danger in such root section is that of overlooking involved or adjacent roots. Nevertheless the conditions for the back of the head are more favorable than those that obtain more distally. If one sections the roots of the second, third, and possibly the fourth cervical nerve, the back of the head must be free from neuralgia. The possibility of neuralgia affecting adjacent areas is not eliminated, especially in cases of long standing where arachnoid proliferation probably exists. The deficiency following sensory root section of the second and third cervical nerves appears to be of no consequence to the patient, since there were scarcely any complaints. JOHN L. LINDQUIST, M.D.

The Surgical Management of Traumatic Cranionasal Fistulas. E. S. GURDJIAN and J. E. WEBSTER. *Surg. Clin. N. America*, 1953, 33: 1115.

The authors point out that repeated attacks of meningitis following a head injury may be due to a cranionasal fistula. Cerebrospinal rhinorrhea does not always appear, despite the communication between the subarachnoid system and the nasal cavity.

Experimental studies by the Stresscoat technique show that marked deformity may occur in the roof of the orbit in the vicinity of the cribriform plate of the ethmoid following blows upon the forward interparietal portions of the head. Such injuries may produce a tear in the dura with the resulting fistula extending into the nasal cavity. Pneumocephalus may appear in some instances. Three cases are reported and 2 of these were subjected to operative repair.

A bifrontal bone flap is advocated in some instances rather than the usual unilateral approach. Exposure of the fistula both inside and outside the dura is recommended, with removal of any herniated brain and careful repair of the dural tear. A graft of temporal fascia has been used to assist in the plastic repair. Subsequent to the repair a layer of gelfoam may be used effectively between the dura and the base of the skull. Such measures alone without adequate dural repair have failed to eliminate the cerebrospinal rhinorrhea.

HOWARD A. BROWN, M.D.

SPINAL CORD AND ITS COVERINGS

Common Whiplash Injuries of the Neck. JAMES R. GAY and KENNETH H. ABBOTT. *J. Am. M. Ass.*, 1953, 152: 1698.

Whiplash injuries of the neck, while never fatal and seldom permanently disabling, comprise a difficult group requiring specialized care usually over a prolonged period.

In the authors' series of 50 patients, slightly over 90 per cent were due to automobile accidents in which one car usually bumped into the back of the car ahead. The forward snap of the head on the body often produces a severe neck spasm which is the cause of a group of involved symptoms. Only 2 of the patients developed ruptured cervical discs requiring surgical treatment. However, initial unconsciousness was not at all uncommon, and the

most common symptom of the entire group was a mild to moderate psychoneurosis which in many ways resembled a postconcussion type of syndrome.

The principal form of therapy consisted in the application of mild heat to the affected part, the use of head traction and a collar, and a great deal of reassurance. The results were generally good, with return to gainful employment, and usually inversely proportional to the degree and time of immobilization. The best results were obtained when minimal attention was directed toward the patient's legal rights and when an early financial settlement was reached. GEORGE M. AUSTIN, M.D.

PERIPHERAL NERVES

The Role of Sympathectomy in the Treatment of Causalgia. ROLAND BARNES. *J. Bone Surg.*, 1953, 35B: 172.

This is a clear and thoughtful analysis of 48 cases of causalgia reviewed with regard to etiology, treatment, and hypothetical mechanism. The lesion was always incomplete, and in the upper extremity involved the brachial plexus or the median nerve. In the lower extremity the sciatic, the popliteal, or the posterior tibial nerves were always involved. The causalgic pain had a burning quality and was located in the hand or foot. Usually it was aggravated by either physical or emotional stimuli as well as by worry or excitement.

Occasionally, slow but steady improvement was noted after several months to a year following the injury. There were great variations in the trophic and vascular changes. Sometimes the afflicted part was warm and glossy, and other times it was cold and clammy. Occasionally only a transient motor paralysis was noted, and there was always a lesion in continuity with the nerve trunk. The author questions whether causalgia ever occurs after complete division of a nerve. Multiple nerve lesions were common and pain was often associated with more than one nerve trunk. The lesions were always due to a high velocity missile and, except in 2 cases, were located above the knee and elbow.

The author concludes unequivocally that sympathectomy is the operation of choice and recommends a preliminary ganglion block. All but 3 of 48 patients were benefited by sympathectomy and failures were due to incomplete denervation. The interval between the onset and the operation was not related to the relief, but early operation is advised in order to take advantage of good muscle tone. Occasionally hyperalgesia persisted postoperatively. Generally the preganglionic operation gave a better result than the postganglionic type.

The author's hypothesis is as follows:

1. High velocity missiles passing close to a nerve cause severe stretch which may cause degeneration of the myelin sheath and axonal damage.

2. Degeneration of the myelin sheath may permit crossfiring at the level of injury, between the sympathetic and sensory fibers.

3. The lowest white ramus to the sympathetic chain comes from the L2 root. Spinal anesthesia below this level will abolish the pain of causalgia and leave the sympathetic innervation intact.

4. In 10 of 14 cases the pain was relieved by a nerve block distal to the lesion.

The author then concludes that if pain is conducted centrally in causalgia by somatic sensory fibers but is relieved by sympathetic ganglion block, then the sympathectomy acts by blocking efferent impulses in the sympathetic fibers. Because of pain relief by block of the nerve distal to the lesion, he postulates a dual mechanism based on an "artificial synapse" at the lesion. Thus, impulses travelling distally from the artificial synapse over somatic sensory nerves will cause a lowered threshold by release of some substance at the sensory nerve endings, while those impulses travelling centrally from the "synapse" will produce pain in the conventional manner.

It would appear that theoretical investigations in these patients should include the action of neurohumoral agents such as acetylcholine and adrenalin, and their inhibitors. Also, the release substance postulated at the nerve endings suggests a possible role for antihistaminics. GEORGE M. AUSTIN, M.D.

Funicular Suture and Funicular Exclusion in the Repair of Severed Nerves. SYDNEY SUNDERLAND. *Brit. J. Surg.*, 1953, 40: 580.

The author of this paper has done careful and controlled investigative work in the peripheral nerve field, as his bibliography well testifies. He discusses the theoretical advantages of funicular repair and exclusion, and the practicability of carrying out this procedure on patients. He gives credit to Langley and Hashimoto as the originators of the idea of funicular suture in 1917.

The advocation of newer methods of nerve repair stems from the present unsatisfactory results obtained under ideal conditions by good surgeons. Factors limiting ideal repair include the following:

1. The entry of axons into functionally unrelated endoneural tubes including other motor or sensory tubes.

2. The entry of regenerating axons into interfunicular tissue.

3. The presence of dissimilar funicular patterns in the severed nerve ends, due to branching and plexus formation.

For these reasons funicular suture presents some advantages over the present method of epineural anastomosis. The method consists in uniting by suture a specific bundle system representing a branch or major division of a nerve. This becomes more important if (1) the isolated bundle differs functionally from the remainder of the nerve or (2) when a change in the shape of the nerve or migration of a bundle from one sector to another results in different positions in the proximal and distal stumps.

Funicular exclusion consists in excluding a relatively unimportant bundle group from the suture

line. In this way important motor funiculi are restrained from cross shunting into relatively unimportant sensory endoneural tubes. Both methods of suture require a thorough knowledge of the course and intraneural anatomy of the major nerve trunks at different positions of the body. They also require the use of very fine, nonirritative suture material handled under some magnification.

The author concludes that the method is difficult, tedious, and time-consuming compared to a simple epineural anastomosis. Yet, if it can be shown to be practical and to yield results of statistical significance, it could be a noteworthy advance in the treatment of peripheral nerve injuries.

GEORGE M. AUSTIN, M.D.

MISCELLANEOUS

The Complications and Dangers of Abrodil Myelography (Ueber Komplikationen und Gefahren bei der Abrodil Myelographie). K. PANTER. *Deut. med. Wschr.*, 1953, 78: 937.

The field of usefulness of lipiodol in myelography is very limited. If this method is employed, it should be followed by operation in the course of which the contrast medium should be aspirated from the dural space. Causalgia, arachnoiditis or granuloma formation of the dura mater may follow the use of lipiodol.

Water-soluble iodine preparations, especially abrodil, have largely replaced lipiodol. The contrast medium is spontaneously absorbed, can be repeatedly employed, and is rapidly distributed throughout the root pockets. The method lends itself only to the study of the lumbar spine and is the best procedure for the diagnosis of a protruded disc, intradural tumors, or spondylolisthesis. An allergy test should precede the introduction of the medium into the dural space; the latter should be anesthesized and abrodil with ephedrine injected very slowly.

In spite of all these precautions, the author observed circulatory collapse in 3 patients. The use of abrodil is contraindicated in patients with hypotension, or valvular or renal lesions. Irritation of the meninges was recorded in a still larger number of cases. In addition to serocellular exudate from arachnoid blood vessels, an active hypersecretion of the chorioid plexus probably takes place. The increase of cells in the lumbar fluid was greater than in the fluid obtained by suboccipital puncture. Acceleration of the sedimentation rate, leucocytosis, and eosinophilia of the circulating blood were frequently observed. Meningismus, nausea, dyspnea, excessive thirst, and general malaise were also recorded. Aliquorrhea or complete disappearance of the spinal fluid was never observed. In 2 cases, symptoms of radicular neuritis and in 3, epileptiform seizures followed the employment of abrodil. Unintentional injection of the dural space occurred twice and was poorly tolerated.

To diminish the danger of circulatory collapse, it is essential to withdraw not more than from 7 to 10 c.c. of spinal fluid to prevent brisk fluctuations of the fluid column. The patient should remain in a sitting position for at least 2 hours following the injection of abrodil. JOSEPH K. NARAT, M.D.

SURGERY OF THE THORAX

CHEST WALL AND BREAST

A Fracture of the First Rib (La frattura della prima costa). GIORGIO AMBROSI. *Rass. ital. chir. med.*, 1952, 2: 231.

The author's patient, while riding at high speed on a velocipede, collided with a truck. He arrived at the hospital in shock with subcutaneous emphysema of the upper portion of the thorax. Roentgenologic examination disclosed the presence of a hemopneumothorax on the right side. An emergency operation for treatment of the pulmonary lesions was instituted (thoracotomy on the right side) and a laceration of the pleural cupula was disclosed. This was 3 cm. in length and a pulmonary tear was directly under it. The fractured lower edge of the first rib could be seen and even better palpated through the laceration. The openings in the parietal pleura and in the pleura of the apex of the lung were both sutured, and the external wound was closed. Only later was the residual blood in the pleural cavity aspirated.

Roentgenologic examination disclosed a complete fracture in the middle third of the first rib on the right side, with only slight displacement of the fragments (Figs. 1 and 2).

A month later palpation did not reveal evidence of the fracture and even maximal respiratory movements no longer produced any pain.

In this instance the mechanism of the fracture can only be surmised; however, it would appear rational to conclude that the patient's chest struck violently against some part of the truck at the time of collision. This occurred during contraction of the scaleni muscles and maximum inspiration with closed glottis. These physiological circumstances brought the long axis of the first rib almost vertical to that of the long axis of the body, with the two edges almost directly lateral and medial and the two faces almost directly upward and downward. The pressure was presumably directed anteroposteriorly and, according to the postulate of Petit, should have produced his "fracture of the lateral border"; however, this would not explain the injury to the pleura and the apex of the lung, both of which lie within the concavity of the first rib. The author, therefore, considers that the pressure conditions were as described but the stress conditions actually produced a fracture of the broad surface of the rib instead of the fracture of the external, or lateral, border of Petit.

The author recalls the words of Betto (*Chir. org. movim*, 1937, 22: 424), postulating an abnormally high and prominent upper portion of the sternum in instances of this fracture, and he presents a photographic image of the patient, which indicates that such a condition was present in this case. JOHN W. BRENNAN, M.D.

Fig. 1 (Ambrosi).

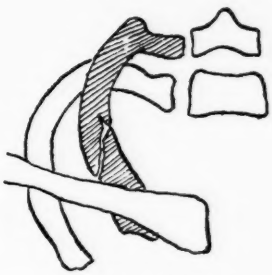

Fig. 2 (Ambrosi).

Coverage of Thoracic Wall Defects by a Split Breast Flap. WILLIAM P. WHALEN. *Plastic & Reconstr. Surg.*, 1953, 11: 64.

In covering large compound defects in the thoracic wall, the author prefers a split breast flap. This method affords the largest amount of readily available tissue of adequate thickness. The principle of the split breast flap is simple. Width of the flap for coverage is obtained at the expense of length. The breast is thoroughly freed from the thoracic wall by an inframammary fold incision, is split in its vertical dimension from above the nipple and areola, about the areola, and onto the lower pole. The areola and nipple may be removed, or may be retained should this extra small amount of tissue be necessary. The blood supply is adequate since the upper aspects of the breast have two good sources of blood supply—a branch of the lateral thoracic artery to the lateral portion and the internal mammary artery to the medial section of the breast. Branches of these arteries, as well as the acromiothoracic and intercostal arteries, supply the skin and fat over the breast. The total procedure requires a minimal length of time and the blood loss is negligible. These two factors are significant in the elderly, debilitated patient. EARL O. LATIMER, M.D.

Postmastectomy Edema of the Arm. W. RALPH DEATON JR., and H. H. BRADSHAW. *Arch Surg.*, 1953, 66: 641.

The incidence of reported postmastectomy edema varies from 10 to 50 per cent. The edema occurs in different degrees, from mild to disabling. The authors attempt to determine which of several factors studied are most frequently associated with this postoperative status.

Historical data beginning with the first publication by Halsted, in 1921, are presented. Halsted attributed the edema to blockage of lymphatic and venous passages, but believed infection to be a most important factor. Reichert proved that the lymphatic channels could bridge the operative scar, in the absence of infection. Other authors advised retention of the pectoralis minor muscles; still others considered constriction of the scar around the axillary vein as responsible for the edema, and advised transposing fat over the axillary vessels. Obesity and infection were thought to be significant by some writers. Hollenbach reported that he obtained good results by transplanting the pectoralis minor muscle to a position surrounding the vessels of the axilla. Daland stressed the part played by infection and the reaction following irradiation. Parker believed that edema was due to thrombosis of the axillary vein and he therefore kept the arm bound for 8 weeks to stimulate recanalization.

The authors present their findings in a study of 24 patients on whom radical mastectomy had been performed. These cases were evaluated from the standpoint of venous pressure, arterial pressure, arm measurements, function of arm, type of cancer, extent, postoperative infection, grafting, and radiation therapy. About 50 per cent of the group showed evidence of edema, i.e., a 2 cm. greater circumference on the operative side. There appeared to be no correlation between increased venous pressure and edema, type of cancer, x-ray therapy, axillary metastases, arterial blood pressures, and the use of the arm. The most constant finding in these patients with edema was the presence of infection or of lymphatic sclerosis. The use of muscle to bridge the axillary space may help in lymphatic drainage.

RICHARD L. LAWTON, M.D.

Antecedent Factors in Cancer of the Breast. EDWARD F. LEWISON. *Ann. Surg.*, 1953, 138: 39.

A study consisting of information obtained from the case histories of three groups of patients is presented, in order to reach some conclusions concerning antecedent factors in cancer of the breast. Two hundred and seventy-two patients with benign breast disease, 186 patients with malignant breast disease, and 107 patients without breast disease were studied. The following conclusions were drawn:

A family history of breast cancer occurred in 9.1 per cent of the patients with breast cancer; in 5.5 per cent of patients with benign breast disease; and in 1.9 per cent of the patients who had no breast disease.

In the three series of patients studied, there was no apparent significant difference concerning the incidence of associated operative or nonoperative gynecological disease. In an age for age comparison, the incidence of single women among patients with breast cancer was 6.6 per cent, among patients with benign breast disease the incidence was 3.9 per cent, and among patients without breast disease the incidence was 3.4 per cent. This apparent prevalence of cancer of the breast among single women is confirmed in an age for age comparison.

A significantly low fertility rate was noted in patients with cancer of the breast. The average number of pregnancies per woman was 1.91 fewer in the cancer series than in the control series. The precise role of lactation in the etiology of cancer of the breast could not be determined, yet it was suggested that the absence of the pregnancy stimulus in the unmarried women could be considered a potential pathogenic factor.

Presumptive evidence indicated that the methods used in the control of lactation could be of some importance. It is suggested by the author that if antecedent factors favor a predisposition toward breast cancer, then frequent and regular re-examination of the breast is the surest means of early recognition of cancer. JOHN E. KARABIN, M.D.

TRACHEA, LUNGS, AND PLEURA

Discussion on the Surgical Treatment of Pulmonary Tuberculosis (La résection dans le traitement chirurgical de la tuberculose pulmonaire). T. HOLMES SELLORS, J. F. NUBOER, M. BERARD, G. MARET, PIERRE GALY, and others. *Acta chir. belg.*, 1953, 52: 433–500.

In the present discussion, SELLORS stated that opinions are divided as to the range and scope of excision of lung. At the extremes are two schools of thought—one which advocates resection exclusively and the other which reserves resection for cases in which other surgical methods have failed or are not suitable.

In Great Britain thoracoplasty remains the procedure of choice by virtue of its low mortality and excellent results.

In many patients subjected to resection, simultaneous or subsequent thoracoplasty may be required. The author adheres to the policy of prolonged bed rest with or without chemotherapy before any form of surgery is employed.

In recent years a thin-walled apical cavity has become much less common than it was while solid lesions and thick-walled cavities which favor resection are encountered more frequently.

The following five conditions or types of disease are suitable for resection: (1) solid lesions, (2) failure of collapse therapy, (3) bronchial lesions, (4) destroyed lung, and (5) pleural involvement.

Formerly, Sellors used phrenicectomy and pneumoperitoneum after lower lobectomy and some upper lobectomies, but he found that a limited thoracoplasty is the preferable procedure.

Following pneumonectomy thoracoplasty is usually considered necessary and, if not performed at the time of the resection, is done 2 weeks later in one or two stages.

In the author's series the high operative mortality, namely 9 per cent, is attributable to the relatively large number of cases in which the operation was performed for extensive or fulminating disease.

NUBOER stated that, in Holland, thoracoplasty and extrapleural pneumothorax are employed whenever pulmonary resection is contraindicated. Collapse therapy is used in from 5 to 10 per cent of all surgical chest cases. The function of the lungs is better preserved by lobectomy or segmental resection than by thoracoplasty. Streptomycin is used only rarely in the conservative treatment. Intrapleural pneumothorax has been practically given up. Para-aminosalicylic acid and isonicotinic acid are used extensively in the conservative treatment.

Standard indications for pulmonary resection are listed as follows: (1) tuberculoma, (2) filled cavities, (3) caseous foci within a lesion of moderate size, (4) primary persistent caseous foci, (5) residual cavities after collapse therapy or after pneumothorax, (6) destroyed lung, (7) bronchial stenosis with retention, (8) moderate size bronchiectases with positive sputum, and (9) specific foci in a lung complicated by empyema, with or without a bronchial fistula.

There are also two relative indications; namely, poor cicatrization after healing of cavities, and unsatisfactory obliteration of cavities after strict conservative therapy.

Of 615 pulmonary resections, 103 were pneumonectomies, 279 were lobectomies, and 233 were segmental resections. In the group of 603 patients treated with para-aminosalicylic acid and streptomycin, the postoperative mortality was 2.3 per cent.

The average loss of function of the lungs after lobectomy was 12 per cent.

The report of BERARD and MARET is based on records of 371 pneumonectomies, 125 upper lobectomies, 81 lower lobectomies, and 58 segmental resections performed in Lyon (France).

The greatest number of failures followed pneumonectomies. The number of fistulas diminished with increasing experience of the surgeon. In the authors' series this complication occurred in 19 per cent of the first 100 operations and in only 6 per cent of the last 50 patients. Of 48 patients with fistulas, 34 succumbed to the condition, in spite of thoracoplasty or pleural drainage with or without aspiration. Usually a fistula develops within the first 3 postoperative months. Empyema may be corollary to a fistula or may develop without it.

Of 52 patients with empyema, or 15 per cent of the entire series, 20 died. Of 14 patients with cardiac complications, 11 expired. While an early contralateral evolution of the tuberculosis occurs in a negligible number of cases, one that appears later than 2 months after the operation was observed by the author in 5 per cent of his cases. Of 371 pneumonectomies, excellent results were obtained in 207. Thoracoplasty was required in 24 patients of this group of 207. The danger of evolution of the specific process in the remaining lobe after upper lobectomy is greater than that of a similar process on the opposite side. Thoracoplasty reduces but does not eliminate this danger.

Of all types of pulmonary resection, inferior lobectomy furnishes the most spectacular results. The authors' experience with segmental resection is so limited as to prevent them from drawing any conclusions.

GALY and PRIGNOT stated that there is divergence of opinion as to indications for pulmonary resection offered by round tuberculous foci. While some surgeons consider each round caseous tuberculous focus as a tuberculoma requiring operation, others point out that regressive evolution of such formations may occur and therefore each case should be considered individually.

Galy and Prignot distinguish four types of round pulmonary foci visible in roentgenograms: (1) pulmonary tuberculoma or laminated focus, (2) homogeneous round caseous focus, (3) focus consisting of a conglomeration of nodules, and (4) rounded scars which are sequelae of regressive processes in cavities.

The etiology of round opacities within lung parenchyma cannot always be determined clinically. Even in patients younger than 40 years of age, 20 per cent of large shadows prove to be of malignant origin.

If the tuberculous character of the lesion is reasonably assured, pulmonary resection is indicated if: (1) bacilli are repeatedly found in the sputum, (2) persistent subfebrile temperature is present, (3) there are signs of bronchial inflammation, (4) the general condition of the patient is unsatisfactory, or (5) cavities are discovered.

A tuberculoma larger than from 3 to 4 cm. in diameter serves as an indication for pulmonary resection.

If a cavity does not empty itself within a few months, resection should be considered.

Round foci formed by a conglomeration of nodules form an indication for resection if retraction is interrupted and a dense, voluminous caseous lesion remains, or when the focus expands in concentric direction.

The following conclusions are drawn by MATHEY and GALEY from observations of 331 patients who underwent pulmonary resection.

While in the very early stages of the work the mortality in the course of the intervention or during the postoperative period was 10.6 per cent, it gradually fell to 2.5 per cent. This was due to increasing experience and also to the widening of indications. Of 200 interventions, approximately one-fourth were pneumonectomies and pleuropneumonectomies with a mortality of 6 per cent, one-third were lobectomies with a mortality lower than 2 per cent, and the rest were segmental resections, without mortality. The total group of 200 operations carried a mortality of 2 per cent.

The frequency of postoperative empyemas gradually fell from 21.4 per cent to 1.3 per cent, and that of fistulas from 18.9 per cent in the first group of 74 operations to none in the last group of 144 interventions.

Pulmonary resection is not a more serious procedure than collapse therapy, provided strict indications are observed. The use of antibiotics, better selection of patients, and improved preoperative treatment are responsible for the marked reduction of mortality and morbidity in the last group of cases reported by the authors. Collapse therapy is now taken into consideration only if resection is contraindicated.

Preoperative studies comprise bronchoscopy, bronchograms, cardiologic examination, and investigation of the pulmonary function.

Small stabilized residual lesions should be treated by resection and not by collapse therapy. Active lesions without cavities belong to the same category, especially if the patient is young, if he lives in a region where strict supervision is impossible, or if preservation of the normal aspect of the chest is imperative—for instance, if the patient is a pilot or serves in the armed forces.

Lesions with medium sized cavities may be treated either by collapse therapy or by resection. The first mentioned method is preferable if a soft-walled cavity is located in the central portion of a lobe. On the other hand, only mediocre results may be expected from collapse therapy if the cavity has thick walls, is located posteriorly, or in the apical region.

Observations on 100 patients who underwent segmental resection led MARMET, DE BEAUJEU, ACKERMANN, PLANE, and RABOUD to the conclusion that the result of this procedure depends on indications. The first 50 operations date so far back that late results can be evaluated. Follow up clinical examinations, supplemented by tomography and cultures of the sputum, showed that good results were obtained in 46 cases.

The pulmonary condition is considered completely arrested if there are no clinical, radiologic, or bacteriologic signs of evolution over a period exceeding 6 months. If no evolution has been noticed for 3 months, but the sputum contains bacilli, the sedimentation rate fluctuates, and lesions in situ are demonstrable in roentgenograms, the condition is considered relatively arrested. The term "subevolution" is applied to mild symptoms existing within the 3 months' period preceding the operation.

Radical resection in completely arrested cases furnishes the best results. In the group of relatively arrested cases radical resection furnishes very good results and focal or segmental resection yields good results. During the period of subevolution, radical resection may be expected to give mediocre but acceptable results while segmental resection should not be attempted.

Indications may be changed according to findings at the time of the operation, and the latter may be supplemented with decortication or extraperiosteal insertion of polyvinyl sponges. To place the diaphragm at rest, these surgeons prefer pneumoperitoneum to phrenicoexeresis.

RAZEMON, SAVINEL and RAMON stated: while improvement in technique and indications has greatly reduced the frequency of early fistulas after lobectomy for tuberculosis, late fistulas or those developing after the first 3 postoperative months still represent a dangerous complication. Of 7 patients with late fistulas, 5 had pinhead size openings in the chest wall.

Treatment consists of cauterization through a bronchoscope of the fistulous tract with swabs saturated with a 30 per cent silver nitrate solution. As a rule, 3 or 4 applications, repeated at intervals of 8 days, are sufficient to produce obliteration of the fistula. The corresponding pleural pocket should be concurrently aspirated and injections of antibiotics should be made into it.

These authors disagree with the statement that bronchial fistulas following lobectomies are always due to a flareup of a local tuberculous infection. Mucous inflammation of the bronchi, pachybronchitis, or a caseous gland in contact with a bronchus may be responsible for the condition.

HEKKING and GOEMANS reviewed the results of 431 pulmonary resections for tuberculosis, performed in a sanitarium in Holland.

Indications are posed by a lung specialist with collaboration of a surgeon and a bronchoscopist. The lung specialist is fully responsible for the entire preoperative and postoperative treatment.

Collapse therapy has been almost completely replaced by pulmonary resection in the authors' sanitarium. They performed 431 resections for tuberculosis and 86 for nonspecific lesions. Of 431 patients, 170 were men and 261 were women. This series comprises 112 pneumonectomies, 193 lobectomies, 55 lobectomies combined with segmental resection, 58 segmental resections, 11 pleuropneumonectomies and 2 pleurectomies.

Tuberculomas are always treated by resection because bedrest, collapse therapy, and antibiotics fail. The same applies to the majority of small caseous masses which are frequently accompanied by deformities of the bronchi.

In the treatment of cavities, preference is also given to resection because the danger of grave complications and functional loss are less than after collapse therapy, extrapleural pneumothorax, or thoracoplasty. The combined early and late mortality after resection in the authors' series was 5 per cent.

Only the patients who showed resistance of their bacilli to streptomycin and para-aminosalicylic acid succumbed to empyema or bacillary dissemination.

Cardiac catheterization is employed routinely. No operation is performed if pressure in the pulmonary artery exceeds 35 mm. of mercury. Early ambulation is advocated.

DAEMS and DE WINTER stated: whereas there is incontroversible evidence that complete rest very

frequently arrests the evolution of specific congestive processes in the lungs, no such effect is noticed on fibrous or necrotic lesions. Antibiotics exert a similar decongestive effect.

Pneumoperitoneum provides the lungs with appreciable physiologic rest, without the inconveniences, sometimes exaggerated or imaginary, of pneumothorax or phrenic exeresis.

Theoretically, surgery is indicated only in patients whose lesion no longer show signs of evolution. Antibiotics should be administered during the preoperative and postoperative period to reduce the danger of dissemination and postoperative congestion or so called epituberculosis.

Collapse therapy should not be discarded because it is successful in 90 per cent of suitable cases.

Lobectomy and segmental resection should replace thoracoplasty in the treatment of bilateral lesions. Bilateral extrapleural pneumothorax may furnish satisfactory results in some cases. If the heterolateral lesion is such as to make volumetric reduction after surgical collapse dangerous, lobectomy and especially simple or multiple segmental resection should replace collapse therapy.

The great drawback to resection is the formation of bronchial fistulas which may lead to pleural suppuration. In the presence of considerable lesions, neither antibiotics nor careful preoperative and postoperative care, nor an impeccable technique are able to prevent this complication.

Pleuropneumonectomy in preference to thoracoplasty is indicated in the presence of a chronic pyothorax caused by a bronchial fistula.

GRENADE, DEHAN, MICHELS, and BLONDEL give streptomycin combined with para-aminosalicylic or isonicotinic acid preoperatively over a period of several weeks. Resumption of professional activity is allowed no sooner than from 6 to 12 months after operation. If resection of more than five ribs is considered necessary for thoracoplasty, they tend to substitute resection for it. In the majority of cases in which resection was performed, bilateral involvement of the lungs was present. No resection is undertaken unless the lesion on the contralateral side is stabilized or perfectly controlled.

In a series of 44 resections, these authors employed lateral position of the patient, general anesthesia and, in a few cases, controlled hypotension to limit hemorrhage in pleurectomies and to prevent cardiovascular reflexes. Drains are inserted after lobectomy or decortication. Effusion after pneumonectomy is treated by repeated aspirations and insufflation of air.

In the treatment of irreversible anatomic sequelae of tuberculosis, such as bronchiectases or extensive sclerocaseous foci, resection is superior to any other surgical procedure. The operative mortality is low and frequently attributable to technical errors. The authors lost 4 of their 44 patients. The most serious complications are listed: bronchial fistula, contralateral infiltration, a similar condition on the side operated upon, peribronchial empyema, and postoperative atelectasis. Clinical, roentgenologic, and laboratory examination established cure in 33 patients.

JOSEPH K. NARAT, M.D.

Late Surgical Treatment of Nonpenetrating Shot Wounds in the Lung, with Functional Results (Operative Spaetbehandlung von Lungensteckschuessen, mit funktionellen Ergebnissen). M WERBER and J. MAURATH. *Chirurg*, 1953, 24: 349.

The authors present a series of 18 cases in which shell fragments or bullets were removed from the lung years after the injury. The indication for surgery was hemoptysis in 14 cases, chronic pneumonia with abscess formation in 1 case, empyema with fistula in 1 case, and severe neuralgiform pains in 2 cases.

All operations were performed under endotracheal anesthesia with curare. In 15 of the 18 cases the shell fragment lay superficially, close to the pleura, and no resection of lung tissue was necessary. In 3 cases the position of the foreign body necessitated lobectomy or pneumectomy.

In 2 cases an empyema developed postoperatively. In both cases the empyema cleared up under antibiotic treatment and drainage, within 4 weeks. All other patients made an uneventful recovery.

Oxygen and carbon dioxide saturation of the arterial blood did not show any appreciable change before and after operation. The vital capacity decreased by 450 c.c., on the average.

WERNER M. SOLMITZ, M.D.

Decortication in the Surgical Treatment of Lung Tuberculosis (Die Dekortikation in der chirurgischen Behandlung der Lungentuberkulose). F. SPATH and W. KOELE. *Langenbecks Arch. u. Deut. Zschr. Chir.*, 1953, 275: 191.

The authors, of the Surgical Department of the University of Graz, Austria, discuss the indications, technique, and advantages of decortication of the lung in tuberculosis.

The technique is described in detail. One rib only is resected, usually the fifth, sixth, or seventh, depending on the site of the lesion. The parietal pleura is separated from the endothoracic fascia, and the empyema sac is removed in toto, which, in most cases, is technically easy. During the intervention the lung is inflated at intervals. It is surprising to what high degree the lung retains its ability of immediate expansion, even after having been compressed for years by adhesions and by the empyema sac. However, if at the end of the decortication a bronchial fistula is found, or it is impossible to inflate the lung because of induration or atelectasis, a resection of the involved lung tissue must be performed after the decortication.

In the majority of cases, it is believed there is no danger of reactivation of a healed tuberculous process as a result of the operation or from inflation of the lung, provided proper antibiotic and chemotherapeutic treatment is employed. Only in cavernous conditions and in bronchial tuberculosis with

secondary stenosis or bronchiectasis is decortication alone contraindicated, but it can be effectively combined with resection of the diseased area.

Decortication is indicated in the following conditions: (1) residual cavities after persistent (or no longer effective) intrapleural or extrapleural pneumothorax; and (2) tuberculous empyema, whether closed or complicated by internal or external fistula.

Altogether, the authors performed decortications in 7 patients with tuberculosis. Four of these cases are described in detail. The late results were excellent in 6 of the patients.

In conclusion the authors list the following advantages of decortication as compared with thoracoplastic operations:

1. The previously collapsed portion of the lung expands readily and functions again after removal of the sac.
2. Deformity of the thoracic wall and of the spinal column is avoided.
3. The time of hospitalization is shortened considerably.
4. The intervention is well tolerated without appreciable reaction or disturbance of the general condition.

WERNER M. SOLMITZ, M.D.

The Polystan Sponge as Plombage Material in Collapse Operations for Pulmonary Tuberculosis and in Stabilizing the Mediastinum Following Pneumonectomy. JENS L. HANSEN and HARALD ENGBERG. *Acta chir. scand.*, 1953, 105: 335.

The authors advocate the use of polystan sponge as plombage material in pneumolysis for tuberculosis. The porous surface of polystan sponge (strands of polyethylene fibers) allows the ingrowth of connective tissue and consequent fixation, which the authors consider necessary if the foreign body is to be tolerated by the tissues. Movement of the plombe leads to effusion and possible infection. This may explain the complications in the series of Morriston Davies, et al., who used polyethylene packs with a smooth nonporous surface, although with the same "extraperiosteal" technique.

The extraperiosteal plombage advocated is similar to the standard thoracoplasty except that the ribs, denuded of periosteum, are preserved and used to hold down the plombe. This preserves the adhesions to the chest wall, and carries the blood and lymph supply to the outer wall of the tuberculous cavity, thereby avoiding such complications as cavity necrosis and fistula formation, which followed intrapleural and extrapleural pneumolysis in the series of Wilson (United States), and Linden and von Rosen (Sweden).

This procedure was used in 80 patients with a total of 90 plombage operations. Seventy-nine per cent of these patients were deemed unfit for any other form of surgery and 42 per cent had severe bilateral lesions. There was no postoperative mortality or complications.

At the end of the 12 to 18 months' follow-up, 3 out of 52 patients (6%) had staphylococcal infection; 60 per cent of the patients were well and sputum-negative; 26 per cent were still sputum-positive; and 8 per cent died during the follow-up period. In more than half of the nonrecovered patients, severe contralateral unoperated lesions were already present at the time of the operation.

After a few months the denuded ribs were covered by new periosteum which grew thicker and more adherent than the original periosteum. Even intercostal muscles have been seen to form, but no intercostal vessels or nerves. The ribs grew thinner and sclerotic and, at the end of 1 year, became replaced by connective tissue. The plombe itself became encased in fibrin and, later, in a fibrous capsule which invaded the meshes. In the first 2 or 3 months after operation, however, absorption of the air in the meshes and the conversion of the effusion to fibrin caused much reduction in the contents of the plombe. Resulting negative pressures of 20 to 40 cm. of water were recorded. Hence, at this stage, there is the risk of some degree of re-expansion of the lung. Much firmer plombes appeared to have solved this problem. In giant cavities, the authors insufflated air into the plombes. They observed that the plombe capsule was capable of maintaining positive pressure as early as 2 weeks after operation.

The authors also employed lung prostheses of polystan sponge to stabilize the mediastinum in 25 pneumonectomies. The operation was complicated by empyema without bronchial fistula in 5 cases (21%), principally in pneumonectomies for suppurative or tuberculous lung disease. The results of lung prosthesis after bronchial carcinoma were more encouraging. Lung prostheses were definitely beneficial in those patients with co-existing heart disease or pulmonary emphysema.

EDWARD F. LEWISON, M.D.

Surgical Considerations in Focalized Pulmonary Histoplasmosis. JAMES H. FORSEE, THOMAS F. PUCKETT, and FRANK E. HAGMAN. *J. Thorac. Surg.*, 1953, 26: 131.

Since February, 1951 the diagnosis of focalized histoplasmosis was made on 30 patients following surgical exploration of the hemithorax and the histologic examination of excised pulmonary and mediastinal lesions. In all but 1 case the diagnosis was based solely on the morphologic characteristics of Histoplasma capsulatum, demonstrated in the excised tissues with the periodic acid-Schiff test.

Formerly considered to be a generalized, and frequently fatal, disease, recent evidence indicates that histoplasmosis is a commonly encountered disease, often manifested in the lungs and often present in a benign form. As the focalized pulmonary lesions of histoplasmosis have become recognized, there has been a marked decline in the incidence of pulmonary lesions classified as tuberculomas, in which the tubercle bacillus was not demonstrated.

Three illustrative cases are presented, with tables showing the age, race, and sex of the patients, their place and length of residence. The results of intra-

dermal tests, complement fixation, and collodion agglutination tests are given.

In this group of patients the symptoms were mild or absent. Fourteen of the 30 patients had no symptoms referable to the chest. In 12, the lesion was noted on a routine chest roentgenogram, and in 2 patients the detection was made as a part of a study to ascertain the cause of epigastric distress. Among these, 1 patient had had roentgenographic evidence of the lesion for 7 years, and 2 patients had shown evidence for 4 years. Sixteen had symptoms referable to the chest, such as hemoptysis, productive cough, chest pain, and moderate loss of weight. The roentgenographic findings were those of any other round or oval density within the lung or mediastinum. Smears and cultures taken from the surgically excised tissues were negative for acid-fast bacilli in all patients. With the use of the Schiff stain, Histoplasma capsulatum was identified in the excised pulmonary or mediastinal lymph node tissue in all patients. Cultures for Histoplasma capsulatum were positive in only 1 patient.

The focalized lesions of pulmonary histoplasmosis are often indistinguishable from neoplasm, tuberculoma, coccidioidoma, and other granulomatous lesions in their roentgenographic or gross appearance, as well as clinical manifestations, and require surgical removal and histopathologic examination of the excised tissue for differentiation.

The surgical excisions can generally be accomplished by wedge excision of the lung tissue containing the lesion. There has been no evidence to indicate that dissemination of the disease results from surgical removal of the focalized lesion. The recognition of histoplasmosis as a granulomatous pulmonary lesion, often focalized and benign, is a further aid in the diagnosis and therapy of lesions within the lung and the mediastinum, the nature of which cannot be ascertained without surgical exploration, removal of the lesion, and histopathologic examination of excised tissue. JOHN H. MOHARDT, M.D.

Block Dissection in Pneumonectomy for Carcinoma. JOHN F. HIGGINSON. *J. Thorac. Surg.*, 1953, 25: 582.

A technique for pneumonectomy which includes block dissection in continuity of adjacent lymphatics is described. A transverse incision is made into the superior mediastinum which is extended vertically from each end to the diaphragm. Included in the roughly elliptical mass removed are fat, lymphatics, thymic area tissue, and pericardium, all of which are mobilized to the hilum of the lung where the pulmonary vessels and bronchus are ligated and divided. The vagus and phrenic nerves are sacrificed; the recurrent laryngeal nerve is preserved wherever possible. Following this procedure, the esophagus and trachea have been stripped of areolar tissue, and the pulmonary vessels divided intrapericardially. The azygos vein is divided on the right side; the aorta is stripped on the left side.

Fig. 1 (Gebauer). Line diagrams depicting use of wedge excision of main bronchial stenosis at the coryna. a, Stenosis of main and upper lobe bronchi. b, Wedge excision of stenosis and removal of upper lobe. c, Rotation of bronchus and transverse closure.

The author believes that this technique allows more complete removal of metastasizing carcinoma and hence offers a better chance of cure, but states that the procedure is of too recent origin to allow the reporting of end results.

ROBERT L. CRAIG, M.D.

Bronchial Resection and Anastomosis. PAUL W. GEBAUER. *J. Thorac. Surg.*, 1953, 26: 241.

The technical applications of bronchial resection for a variety of tracheobronchial lesions are discussed. Sleeve resection and anastomosis of the main bronchi, of lobar bronchi (particularly right upper lobe bronchi), and the intermediate bronchus were performed by this technique. Wedge excision was found to be satisfactory in cases of upper lobe stenosis with stenosis of the adjacent main bronchus. For these cases, wedge excision with rotation of the lower edge to meet the upper margin of the bronchial tube was performed at the time of upper lobectomy. Bronchial defects of less than one-half the bronchial circumference were best repaired by transverse closure. In selected cases a bronchial defect could be closed with greater ease if the neighboring lung segment were sacrificed and its stump were used for a flap in the bronchial closure. Complete or partial bronchial division was especially indicated for the salvage of a normal middle lobe, the bronchus of which is fused to the branch bronchus of the atelectatic lower lobe. Restoration can then be accomplished by anastomosis of the middle lobe bronchus to the proximal bronchial stump.

In cases of combined severe tracheal and right bronchial stenosis, a technique of bronchial resection and transplantation was performed.

B. G. P. SHAFIROFF, M.D.

Value of Bronchospirometry for the Success of Pulmonary Resection (Die Bedeutung der Bronchospirometrie fuer den Erfolg bei Lungenresektionen). J. MAURATH and P. UHLBACH. *Langenbecks Arch. u. Deut. Zschr. Chir.*, 1953, 275: 281.

While spirographic methods allow appraisal of the ventilation of both lungs, and the analysis of arterial blood furnishes information concerning the gas exchange in the lungs, bronchospirometry or measurement of the ventilation of one lung gives an estimate

of the vital capacity of the remaining lung after unilateral pulmonectomy and of the respiratory reserve, or so-called "Grenz" figures.

On the basis of 370 bronchospirometric determinations, the authors came to the conclusion that this method contributes to the lowering of the mortality of pulmonary resection.

In 10 per cent of the patients the expected postoperative respiratory reserve was so low that from the functional point of view pulmonectomy was prohibited. In 7 per cent of the series the respiratory reserve was unsatisfactory. In 56 patients the respiratory "Grenz" figure before the operation was 54 liters and after pulmonectomy, 56 liters. The average decrease of the vital capacity after pulmonectomy was 370 c.c., while the increase of the respiratory reserve averaged 2 liters. The conclusion is allowed that determination of the vital capacity is useless for prediction of the postoperative respiratory reserve.

Bronchospirometric determinations establish the limits of operability and thus reduce the mortality after pulmonectomy. JOSEPH K. NARAT, M.D.

Developmental Basis of Segmental Resection; Contribution to the Problem of Segmental Structure of the Lungs and the Resulting Suggestion Pertaining to the Operative Technique (Die entwicklungsgeschichtlichen Grundlagen der Segmentresektionen. Ein Beitrag zu dem Problem des segmentalen Aufbaues der Lunge und den sich daraus ergebenden operationstechnischen Folgerungen). KARL ZUSCHNIED. *Langenbecks Arch. u. Deut. Zschr. Chir.*, 1953, 275: 212.

Anatomic studies by Boyden and Jackson have facilitated the topographic analysis of secondary and tertiary bronchi and have demonstrated the variability of topographic relations of the bronchi, arteries, and veins.

The author injected a 10 per cent stained gelatin solution into secondary hila of lungs obtained from fetuses between 6 and 10 months of age. In another series of experiments a contrast medium was introduced into a number of fetal lungs between 4 and 10 months old and roentgenograms were made. The total number of lungs studied with either method was 30.

The attempt to preserve as much pulmonary tissue as possible has led to a systematic subdivision of the bronchial tree into segmental and subsegmental bronchi. However, the complicated topographic condition in tertiary hilum regions unduly prolongs the operative procedure. Such painstaking differentiation is possible only in selected cases. As a rule, differentiation of 8 segments or segmental groups is sufficient for proper surgical treatment. These segments could be clearly demonstrated by the author in both series of experiments on the fetal lungs.

The development of the bronchial tree during the second prenatal phase, namely, from the sixth to the tenth month, is the chief factor in determination of the extent of segmental resection, while the considerable variations of subsegmental growth during the postnatal phase make subsegmental resections impractical. JOSEPH K. NARAT, M.D.

Lobar Obstructive Emphysema in Infancy Treated by Lobectomy. HERBERT SLOAN. *J. Thorac. Surg.*, 1953, 26: 1.

Localized emphysema is commonplace in the presence of pulmonary infection or an intrabronchial foreign body, but rarely has it been described in otherwise apparently normal infants. Lobar obstructive emphysema in infancy, produced by an abnormality of the bronchus, is being recognized with increasing frequency.

Severe obstructive emphysema, most marked in a single lobe, has been observed by the author in 4 infants. In 2 of the infants the left upper lobe was involved; in 2, the right middle lobe. Lobectomy was performed successfully in each of the infants; the youngest was 6 days old, and the oldest was 8 months old. Each of the lobes removed showed marked, generalized emphysema. Infection was not present. No specific bronchial obstruction was found. It is believed that the obstructive emphysema was due to a check valve mechanism produced by abnormal flaccidity of the bronchi. Each of the infants was improved by lobectomy; however, all had respiratory symptoms following discharge. In 2 of the infants there was roentgenographic evidence of emphysema in other portions of the lungs following operation. It is suggested that the bronchial abnormality also involved other portions of the bronchial tree. W. FOSTER MONTGOMERY, M.D.

HEART AND PERICARDIUM

Atrioseptopexy for Interatrial Septal Defects. CHARLES P. BAILEY, HOUCK E. BOLTON, WILLIAM L JAMISON, and WILFORD B. NEPTUNE. *J. Thorac. Surg.*, 1953, 26: 184.

The concept and technique of atrioseptopexy embraces freely those intracardiac techniques which aid in the successful accomplishment of the complete anatomic and physiologic separation of the systemic and pulmonary venous systems. Inasmuch as the original basic concept has proved to be sound, certain technical variations have been developed in order to manage the different clinical variants of this situation. The original method has been modified in cases presenting the additional abnormality of anomalous entrance of some or all of the pulmonary veins into the superior vena cava or directly into the right atrium. Very low defects of the persistent ostium primum type have been proved to be amenable to this technique. The coexistence of acquired mitral stenosis (Lutembacher syndrome) in certain of these cases has proved no serious obstacle to successful simultaneous surgical correction of both conditions. Only patients with essentially a single atrial chamber have so far seemed completely unsuitable for correction by atrioseptopexy. A critical analysis of the various methods of closure and their correlation with the author's procedure is presented.

In general the closure of the septal defect has been attempted by employing autogenous tissue

(Schumacker and Merendino), or prosthetics (Hufnagel and Gross) in an attempt to meet this need, and the invaginated right auricular appendage (Cohn), or both appendages (Swan) to supply the deficiency. These latter efforts have suggested a more logical method of supplying the frequently very large deficiency. It was concluded that the nearly always greatly dilated outer right atrial wall would seem to offer an ideal and adequate supply of available excess cardiovascular tissue. It is readily applicable to the septum by simple invagination with maintenance of adequate passages for the blood to travel from the respective venae cavae to the tricuspid valve, and constitutes the essential feature of the authors' variation, added to which is the digital guidance of the suturing by a finger inserted through the right auricular appendage. At this time commissurotomy may be performed for associated lesions such as coexisting mitral stenosis or anomalous entrance of the right pulmonary veins into the right atrium and/or superior vena cava.

No significant interference with the flow of vena caval blood need be produced. The auriculoventricular valves need not be disturbed. Should it ever prove necessary to interrupt completely the superior vena caval flow, this can be tolerated if the azygos vein system is preserved intact.

Coexisting total transposition of all pulmonary venous return probably requires a two-stage surgical procedure for its correction and it is thought that very low defects such as persistent ostium primum may require the addition of anteroposterior approximating atrial mattress sutures. To date the results obtained in correcting defects of the septum secundum have been reasonably satisfactory. In 14 cases there was an operative mortality of 14.3 per cent; complete anatomic correlation was proved in 4 of 6 cases studied by catheterization (66.3%); and clinical improvement was notable in all of the survivors (100%). In 7 cases of persistent ostium primum, complete closure of the defect was accomplished in 4 instances. Deaths occurred in 3 of the 7 patients (43%) apparently as a result of unrelated factors, viz., hypothermic depression of the myocardium, renal shutdown, or poor condition. Surgery itself should not entail a great mortality. STEPHEN A. ZIEMAN, M.D.

Aortic Commissurotomy. HENRY BYRON LARZELERE and CHARLES PHILAMORE BAILEY. *J. Thorac. Surg.*, 1953, 26: 31.

The authors review the etiology and pathogenesis of aortic stenosis, and report the autopsy findings in 6 of 42 cases in which aortic commissurotomy had been performed.

The present technique of aortic commissurotomy is outlined. Forty-two cases of aortic stenosis, with and without other valvular disease, are presented; in each instance aortic commissurotomy was performed. There were included 21 cases with mitral commissurotomy simultaneously performed, 2 with mitral commissurorrhaphy, 2 with both mitral commissurotomy and commissurorrhaphy, and 1 with transaortic nylon tamponage of the aortic valve.

A discussion of the physiology and technique is presented; the preoperative evaluation and indications for aortic commissurotomy are considered. There were 7 deaths—a mortality of 16.6 per cent. Of the patients with an isolated aortic valve, 77 per cent are improved. Of the multivalvular cases, 72.4 per cent are improved. Operative and postoperative complications are discussed.

In conclusion the authors state that the theoretical concepts, the developmental experiences, and the clinical and pathologic results of this work encourage us to hope that aortic commissurotomy for aortic stenosis will prove to be as permanently beneficial as is mitral commissurotomy for mitral stenosis.

W. FOSTER MONTGOMERY, M.D.

Cysts About the Pericardium. CARL DAVIS, JR., JOHN DORSEY, and EDWARD SCANLON. *Arch. Surg.*, 1953, 67: 110.

Two cases of thin-walled cysts of the mediastinum in close relationship to the pericardium are discussed. One patient had symptoms of deep-seated intrathoracic pain of 4 or 5 years' duration. In the other patient the lesion was asymptomatic. In one case the cyst produced a radiographic opacity projecting into the hilus of the right lung. Roentgenograms of the other patient showed a rounded area of increased density in the region of the left cardiophrenic angle. Both patients were subjected to exploratory thoracotomy and the cysts were excised. Communications between the cysts and the pericardiums were not demonstrated. One cyst measured 8 by 6 by 5 cm. in diameter and the others measured about 6 cm.

Thin-walled cysts of the mediastinum have been called pleuropericardial cysts, "spring water cysts," "pericardial celomic cysts," "mesothelial mediastinal cysts," "hydrocele of the mediastinum," and "lymphogenous cysts." They are usually asymptomatic. In the majority of cases they are at the cardiophrenic angle, and rarely at higher levels in the anterior mediastinum. Occasionally the interior of the cyst may communicate with the pericardial cavity. More often they are connected by pedicles from the cardiophrenic angle.

The diagnosis is usually made by routine roentgenologic examination. The differential diagnosis includes hernia of the foramen of Morgagni and other tumors and cysts of the mediastinum.

Early surgical excision of these cysts is recommended because only at surgery can definite differentiation from more serious malignant tumors be made. FREDERICK W. PRESTON, M.D.

The Arterial Oxygen Tension in Rest and During Effort as a Test of Pulmonary Function. VIKING OLOV BJÖRK, PAN A. MICHAS, and LARS G. UGGLA. *J. Thorac. Surg.*, 1953, 25: 558.

A study of the arterial pCO_2 and pO_2 was made at rest and during effort in 29 healthy individuals

and in 108 patients with pulmonary disease. This method of measurement is superior to the saturation method when small changes are to be measured. There is no significant change in arterial pO_2 with exercise in cases with low pulmonary reserve when compared with resting arterial pO_2 in the same individual. This may be due to compensatory hyperventilation with exercise. The resting pO_2 is a good indication of pulmonary reserve function. Normal arterial pO_2 at rest was 86.3 ± 1.08 mm. of mercury. Approximately 70 mm. is borderline, and values below 65 mm. are regarded as pathologic. There is also a significant correlation between both the ventilatory reserve and the pO_2 at rest in both men and women.

ROBERT L. CRAIG, M.D.

ESOPHAGUS AND MEDIASTINUM

The Present Criteria for the Surgical Treatment of Foreign Bodies in the Esophagus (Criteri attuali del trattamento chirurgico dei corpi estranei esofagei). F. RABBONI. *Ann. ital. chir.*, 1953, 30: 387.

The author reports a case of foreign body in the esophagus (dental prosthesis) that was removed by means of a surgical procedure.

The prosthesis was swallowed by the patient and, after unsuccessful esophagoscopy, he was admitted to the Surgical Department at Palermo University a week later. The foreign body was palpable on the left side of the neck. The general condition of the patient was good.

The author recommended that in all cases of foreign body in the esophagus, esophagoscopy be performed to determine if it can be removed directly; in other cases, the procedure of choice is esophagotomy.

The important thing in esophagoscopy is to localize the foreign body. In cases in which the foreign body is located in the cervical region, external esophagotomy with antibiotic therapy is indicated. If the foreign body is localized in the thoracic portion of the esophagus, a transpleural thoracotomy with esophagotomy is indicated. If the foreign body is localized in the abdominal esophagus, gastrotomy is indicated. External esophagotomy for removal of a foreign body from the esophagus was first performed in France by Goursand in 1738.

The author describes the preoperative and postoperative care necessary when an external esophagotomy is performed. He considers aspiration pneumonia as the most frequent complication. The operative mortality varies from 12 to 20 per cent, depending on the time interval between the accident and the operation. After 72 hours, the mortality from esophagotomy for removal of a foreign body increases to 38 per cent. The author reports the more frequent complications of esophagotomy as (1) esophageal perforation with abscess or phlegmom in the neck, (2) mediastinitis, and (3) tracheoesophageal fistula or bronchial esophageal fistula.

In the cases which develop mediastinitis, the treatment of choice is posterior transthoracic mediastinostomy. In all cases, antibiotic therapy is indicated. The author states that foreign bodies in the esophagus are best removed by esophagoscopy, and when this is unsuccessful, esophagotomy is the procedure of choice. However, he does not recommend too many attempts with the esophagoscope, because the traumatic removal of the foreign body often causes retraction and stenosis of the esophagus. Esophagotomy is recommended in all cases in which the foreign body is large or irregular in shape. External cervical esophagotomy is recommended in the cases in which the pharynx is infected, with or without generalized infection. In conjunction with drainage of the fascial planes of the neck, when the foreign body is localized in the thoracic esophagus, thoracotomy with mediastinotomy should be performed.

M. LÓPEZ BELIO, M.D.

High Median Sternotomy in the Treatment of Tumors of the Mediastinum (La sternotomie médiane haute dans le traitement des tumeurs du médiastin). H. WELTI. *Lyon chir.*, 1953, 48: 5.

Median sternotomy is the first choice of method for the removal of tumors of the anterior mediastinum. It is, also, a useful method for the removal of tumors which are located at the base of the neck and connected with the upper part of the anterior or posterior mediastinum.

Closed anesthesia with tracheal intubation is recommended for the comfort of the patient and as a safeguard against the danger of pleural injury. In a series of consecutive sternotomies by the author, there has not been a single opening of the pleura. In 3 cases, the operation had to be done under local anesthesia.

A cutaneous incision is made over the midline of the sternum, extending from 2 fingerbreadths above the manubrium down to the level of the third or fourth intercostal space. A second incision is made at right angles to the first incision in the fold of the skin at the base of the neck as in an operation for goiter. This cervical incision permits dissection at the base of the neck and an approach to the tumor through the sternum, not only from the front backward but also from above downward.

On each side the cutaneous edges of the median incision are dissected and separated from the anterior surface of the sternum. The dissection is carried laterally to the insertion of the pectoralis major muscle, and upward to the insertion of the sternocleidomastoid muscle. It is useless to carry this dissection to the external border of the sternum as the perforating intercostal vessels, which are well developed in cases of mediastinal tumors, would thereby be exposed to injury. Above, the cutaneous edges are dissected to the external extremities of the transverse incision. The superior flap of the cervical incision is elevated.

The sternocleidomastoid and the sternothyroid muscles are exposed and their internal borders are freed. The thyroid isthmus and the anterior surface of the trachea are exposed. Superiorly, the sub-

thyroid muscles may be sectioned transversely to give a better exposure. Inferiorly, behind the sternum, the internal border of the subhyoid muscles will become an important guide for the protection of the pleurae. Behind their long insertion, sternal and clavicular, they insert themselves on the pleurae, and their separation is sufficient to open both pleural cul-de-sacs.

In sectioning the sternum, the use of the Gigli saw is dangerous to the pleura. Lobsche or Gosset scissors are used for this purpose. The sternum is sectioned from below upward. It is first perforated at the level of the lowest point of the manubrium with a Doyen boring bit and then sectioned from below upward, along the median line from the burr hole through the manubrium. It is easy to protect the bone contacts for, contrary to those which exist on the superior border of the manubrium, the periosteum and the endothoracic aponeurosis do not adhere to the posterior surface of the bone. Section of the bone is made in front of the fibrous plane, far from the pleura. After the median section of the sternum is completed, a transverse section is made at the level of the second or third intercostal space, with care not to injure the internal mammary and pleural vessels, the hemostasis of which is difficult.

For the bone, a rongeur is used to resect the entire median portion of the sternum, care being taken as one proceeds outwardly as a broad band of bone articulates with the sternum.

The sternal resection affords an advantage. At the end of the operation, approach to the sternocostal portion is not only made possible, but, with sternotomy limited to a segment of the sternum, suture is not necessary.

When a tumor compromises the mediastinal vessels, vascularization of the bone is considerable, and it is useful to have wax at one's disposal in order to assure hemostasis of the bone edges.

In spite of the bone section of its two halves, the sternum is not divided and it is necessary to incise the retrosternal fibrous fascia longitudinally throughout the entire vertical section, and transversely downward. Self-retaining retractors are put in place to maintain separation of the bone.

In order to enter the mediastinum, it is necessary to push back the two pleural cul-de-sacs.

The separation of the internal border of the sternocleidomastoid and the sternothyroid muscles, which was begun in the neck, is completed. The median cervical aponeurosis, the transverse fibers of which are generally visible, is incised in the median line. The muscles can then be pushed back and with them the pleural cul-de sac to which they adhere. In the lower part of the wound, great care is necessary as the two pleurae dovetail into each other at this point.

In a normal subject, the thymus is now uncovered and next the left brachiocephalic venous trunk is encountered in a transverse position. To the right, behind the lateral border of the sternum, it unites with the right brachiocephalic venous trunk to form the superior vena cava. On elevation of the right border of the sternum and pushing back of the pleura, the superior vena cava becomes visible down to its penetration into the pericardium. Posteriorly to the left is found the aorta, which ascends, first, ensheathed in the fibrous pericardium, and then it arches to direct itself backward. It gives rise to the brachiocephalic arterial trunk, which is posterior to the left brachiocephalic venous trunk and in apposition to the right lateral aspect of the trachea. Posteriorly to this vascular root and posteriorly and beneath the trachea are seen the origins of the two bronchi.

These organs tend to prevent the removal of all tumors which are not strictly retrosternal.

Three eventualities are possible.

The first is that the tumor may be in direct contact with the sternum and is readily apparent after completing the sternotomy.

The second is that the tumor is at a distance from the sternum, but situated in the upper part of the mediastinum. It pushes the organs in this part of the mediastinum laterally and permits easy removal.

The third is that the tumor is situated below, posteriorly and, sometimes, wholly behind the bronchial pedicle. Removal by median sternotomy is impossible.

The tumor having been removed, the wound is sutured. The two sternal borders cannot be brought together on account of the previous rongeuring. Some difficulty is experienced, for the sternotomy can only be partially closed. Therefore, the patient has some respiratory difficulty postoperatively. In time, each sternal half welds itself into the base of the sternum.

With this operation, it is possible to afford protection to the pleurae. In cases in which the approach has been made transpleural, it is often difficult to push the pleura to the side opposite to the approach.

It affords an excellent safeguard to the large mediastinal vessels which are in relationship to the tumor. This operation not only diminishes the risk of damage to the vessels but, if such an accident occurs, it affords better access for repair of the damage and prevents excessive hemorrhage.

When the transpleural route is used, it is often difficult to ligate the pedicle of the tumor. With sternotomy the ligation is easy as the pedicle is well exposed. This advantage is particularly great in the case of thoracic goiter, the cervical vessels of which cannot be correctly ligated through the lateral or transpleural approach.

Sternotomy is the operation of choice for the removal of anterior mediastinal tumors. It is indicated especially in cases in which the tumor is in the superior mediastinum and occupies both the anterior and posterior part of this structure. It is indicated in cases in which the tumor is not even in direct contact with the sternum.

Median sternotomy cannot be employed when tumors of the posterior mediastinum occur behind

and above the bronchial pedicle, especially when they extend so that they are more thoracic than mediastinal. If the tumor is situated high in the mediastinum, cervical sternotomy is advisable.

Median sternotomy has been used twice for the resection of the internal half of the clavicle. It is useful in the removal of aneurysms at the base of the neck as hemostasis can be readily secured.

The operation of median sternotomy was used by the author in 12 cases as follows: 1 thymic tumor, 2 teratomas, 1 mucoid cyst, 1 tubercle, 1 inflammatory tumor obstructing the superior vena cava, 5 retrosternal goiters, and 1 dermoid cyst.

BLACKWELL MARKHAM, M.D.

MISCELLANEOUS

Hernias Through the Esophageal Hiatus and the Cardiofundus Deformities in Nurslings and Infants (Les hernies par l'hiatus oesophagien et les malpositions cardio-tubérositaires chez le nourrisson et chez l'enfant). BERNARD DUHAMEL, JACQUES SAUVEGRAIN, and NATHALIE P. MASSE. *Poumon*, 1953, 9: 33.

Until recent years, hernias through the esophageal hiatus were considered rare and without particular surgical indications in infants. Pediatricians have recognized the occurrence of an anomaly called brachyesophagus which, due to its supposed anatomical characteristics, could not be relieved by surgery.

The authors have studied anomalies of the esophagocardiofundic area in nurslings and infants, and their progressive experience has led them to discount the majority of the customarily held opinions. They present their views of the whole subject based upon a study of 70 cases, in 35 of which operation was carried out.

Statistics prove decidedly that hernias through the esophageal hiatus are far more common in infants than diaphragmatic hernias. During the last 3 years the authors have operated upon (in addition to the 35 hernias through the esophageal hiatus) 10 consecutive diaphragmatic hernias lateral to the foramen of Bochdalek, 1 retrocostoxyphoid hernia, and 1 traumatic hernia.

Most pediatricians admit as true hernias only the large hernias through the esophageal hiatus. These extend into the base of the right thorax and are characterized, clinically, by associated digestive and respiratory signs. Roentgenologically, they can be diagnosed by a single examination without prior preparation. These essentially diaphragmatic deformities are in contrast to the congenital brachyesophagus, a malformation of the digestive tube.

Clinically, all of the cardiofundic deformities reveal certain characteristic signs.

Vomiting is the most common sign. It occurred in 56 of the 70 cases reported. It occurs from the time of birth (44 cases) or in the early days of life. It rarely occurs later, and when it does occur later it generally occurs as an accessory symptom of a voluminous hernia. Many times, it has been observed that the acid character of the vomitus erodes the lips and cheeks of the infant.

Reflux of the acid contents of the vomitus into the esophagus explains the occurrence of early esophagitis, of which the first sign is hemorrhage. This occurred 39 times in this series of cases.

It is possible that some hemorrhage remains occult as certain infants present a severe hypochromic anemia, the anemia of diaphragmatic hernia being well recognized.

Malnutrition is an equally constant sign. It even exists in cases in which vomiting is of minor importance. All infants examined showed a body weight under the normal for their age.

Death may occur from vomitus inspirated into the air passages, which leads to an intercurrent infection.

All the infants in the series were given a course of the dietetic-postural treatment of Lelang. The treatment gave practically no change in the clinical picture of these cases.

Roentgenological studies must be made in the reclining position. Plates must be taken in series from the time of the swallowing of the opaque solution until it has passed the esophagocardiofundic area.

The plates must be of a size large enough to allow visibility of the whole stomach and esophagus.

Roentgenologic examination affords three classifications of these deformities.

The first is the common form which corresponds to the classic brachyesophagus, that is, to the small hiatal hernias or the cardiofundic deformities.

The second is the large type, which includes the hernias right through the esophageal hiatus.

The third type is that which includes the small deformities of the lower esophagus and the cardia.

Thirty-five of the infants of the series reported were operated upon. The indications for operation were the grave vomiting syndrome, progressive change in the general condition, hemorrhage, and occurrence of a cardioesophageal stenosis. Operation was also done in cases of large direct multivisceral hernias, which present the same operative indications as do the congenital diaphragmatic hernias.

Of the 35 infants treated surgically, 1 died during an exploratory mediastinal operation to free an esophageal stenosis. A second patient died in extremis during an emergency operation.

Thirty-three patients were cured. In 7 of these the operation was carried out by way of the abdominal route and in 26 it was performed by way of a left thoracic approach. There were no recurrences.

BLACKWELL MARKHAM, M.D.

Traumatic Chylothorax Caused by Contusion. Ligation of Thoracic Duct with Recovery (Chylothorax traumatique par contusion. Ligature du canal thoracique. Guérison). M. MICHEL VANDOOREN. *Poumon*, 1953, 9: 237.

A man, aged 54, developed severe dyspnea following a fall. Roentgenograms revealed a fracture of the right ninth and tenth ribs and an opacity over

the entire right side of the chest. Repeated aspirations established the presence of a chylothorax. Drainage, restriction of the fluid intake, the avoidance of fats, a protein rich diet, and daily blood and plasma transfusions failed to produce a cure and therefore an operation was performed 17 days after the accident. Through a thoracotomy on the right side a laceration of the thoracic duct 3 cm. above the diaphragmatic vault was discovered and the proximal end of the duct was ligated. The patient made an uneventful recovery.

The author collected from the literature 21 reports of chylothorax treated by ligation or anastomosis, with 2 fatal outcomes.

Results of animal experimentation show that, because of the collateral circulation, no chylothorax forms following ligation of the thoracic duct.

Unless conservative treatment is followed by good results, surgical treatment should not be delayed longer than 7 days. A low transthoracic approach on the left side seems to offer certain advantages.

JOSEPH K. NARAT, M.D.

Hydatid Disease As It Affects the Thoracic Surgeon. M. P. SUSMAN. *J. Thorac. Surg.*, 1953, 26: 111.

This article is based on a study of 78 hydatid cysts of which 66 were pulmonary, 10 hepatic, 1 was diaphragmatic and 1 cardiac. Some of the general features of hydatid disease, the methods of diagnosis, and the principles of treatment are discussed.

The life cycle, dissemination of the disease, behavior and characteristics of the infecting organism are reviewed and certain biologic features which influence the incidence of the disease and its distribution in different organs are presented.

Simple cysts are usually latent and may be discovered only by the finding of a swelling, or by routine roentgenographic examination of the lungs. Sometimes there may be symptoms from pressure, but as a rule symptoms are due to the anaphylactic, mechanical, and infective sequelae of rupture of the cyst. After rupture a hydatid cyst may mimic many other conditions such as a neoplasm, tuberculosis, and other infections. A ruptured cyst of the liver is often mistaken for cholelithiasis or one of the various types of jaundice. The diagnosis can often be made by certain tests and examinations and by correctly interpreting anaphylactic phenomena.

Anaphylaxis is responsible for most of the alarming symptoms that follow rupture of a hydatid cyst; it is due to the absorption of hydatid antigen in a person who already has been sensitized by the small dose that he receives during the development of the cyst. The symptoms are variable and only rarely do all possible ones appear in one patient: cutaneous (rashes, itching, and sweating), alimentary (vomiting, diarrhea, and colic), respiratory (asthmatic attacks, cyanosis, edema of the lungs, and glottis), cardiovascular (pallor, tachycardia, and collapse), and nervous (pyrexia, fits, delirium, and coma).

It is important to remember that even in severe cases there may be no telltale rash. Recovery is the rule but there may be a repetition following fresh rupture or operation. The anaphylactic symptoms may be so slight that they are missed and the patient presents himself with the mechanical or infective sequelae to the rupture or later with evidence of daughter cyst formation.

When a cyst ruptures into the bronchial tree, hydatid elements may be found in the sputum. If it ruptures into the biliary tree, hydatid material may be recovered from the feces or from duodenal washings, and if it ruptures into the urinary tract the material may be found in the urine. If a pulmonary cyst has ruptured into the pleural cavity, hydatid elements may be recovered from the aspirated fluid.

Eosinophilia is found in about half of the patients before operation. The Casoni intradermal test is a test for anaphylactic states and is positive in those who have been sensitized to the hydatid antigen. The reagent is pooled hydatid fluid from uncomplicated cysts of sheep. The complement fixation test is a specific test for antibodies and is positive in 50 to 60 per cent of patients.

The roentgenologic appearance of pulmonary cysts, hepatic cysts, and cysts of the heart and pericardium is discussed and visualized. Most of the cysts of the lung if not operated on will rupture into a bronchus by pressure necrosis and may result in asphyxia, acute anaphylactic shock, or hemorrhage, which is rarely severe. Later results are retention of membrane or fluid, infection of the cyst space, often associated with recurrent hemoptysis, and development of daughter cysts. The sequelae of rupture into the pleural cavity are pneumothorax, empyema or pyothorax, and the development of daughter cysts from the split scolices.

The objects of operation are complete removal of the cyst, avoidance of soiling and infection, obliteration of the space which the cyst occupied, closure of bronchial fistulas, and prompt re-expansion of the lung. The types of operation are removal of the parasite alone or with the pericyst (adventitia), and resection of the lung or a part of the lung.

Conservative surgery suffices for almost all simple cysts and for most of the complicated cysts. Radical surgery may be necessary for a simple cyst if serious hemorrhage occurs during a conservative operation, or if the cyst has replaced most of the lobe. Radical surgery may be required for a complicated cyst with recurrent hemorrhage (hemoptysis), for gross sepsis in and around the cyst, and for symptomatic bronchiectasis. Cardiac hydatids are as amenable to surgery as cysts elsewhere.

J. H. MOHARDT, M.D.

Transactions of the Medico-Chirurgical Society of Edinburgh: Thymectomy in Myasthenia Gravis. D. M. DUNLOP. *Edinburgh M. J.*, 1953, 60: 59.

The author reports the results obtained in the treatment of 27 patients with myasthenia gravis during the period between 1943 and 1953. Of these,

19 were operated upon for the removal of the thymus. Of the 8 patients who were not operated upon, 1 died, and the remaining 7 are living fairly comfortably with their disease, with the aid of prostigmine. This satisfactory course makes it necessary to appraise carefully the results of thymectomy because a satisfactory prognosis may occur even without thymectomy.

Interest in the thymus, in its relation to myasthenia, began in 1901 when Weigert reported a thymic tumor found at autopsy in a myasthenic patient. Subsequent interest in this combination of conditions brought many reports of this nature and it is now believed that approximately 15 per cent of myasthenics have an associated thymoma. These are considered benign, although invasion of the surrounding tissues may occasionally occur. In the absence of a thymoma, microscopic changes within the germinal centers of the thymus have been reported by some as being of etiologic significance. Thymectomy has been recommended when a thymoma is discovered, and some observers believe that even in the absence of a true tumor the thymus should be ablated.

The author states that a statistical inference from his series would be unfair because of its small size; however, in the summaries of his cases it is apparent that some of his patients have been benefited remarkably while others have had no relief at all. It is his opinion (and this is shared by others) that patients with mild or localized myasthenia gravis who respond well to neostigmine, and patients over the age of 40 should not be operated upon. Patients under the age of 35 with short histories of generalized severe myasthenia, who have not been taking neostigmine for long periods, seem to be the most successful candidates for the operation. In addition, the author believes that all patients with a demonstrable thymoma should be operated upon.

HAROLD M. UNGER, M.D.

Transactions of the Medico-Chirurgical Society of Edinburgh: Thymectomy in Myasthenia Gravis. K. PATERSON BROWN. *Edinburgh M. J.*, 1953, 60: 70.

This author quotes his experience with thymectomy in 14 patients with myasthenia gravis. Only 2 of these patients had thymomas. An article published by Geoffrey Keynes is mentioned and his statistics on 155 cases of myasthenia in which he performed thymectomy are discussed. Of the patients 32.5 per cent were well and no longer required prostigmine; 33.3 per cent were greatly benefited but still required some prostigmine. Only 8.3 per cent showed no improvement in their condition. There was a mortality rate of 4.2 per cent in the last 119 cases.

The preoperative preparation and the operative technique of the author are briefly described. There was only 1 death in the series and this occurred in a poor risk patient. Of the 2 patients who had thymomas, one died and the other has had recurrent symptoms since the operation. The long term follow-up of the remaining 11 patients is not discussed.

HAROLD M. UNGER, M.D.

SURGERY OF THE ABDOMEN

GASTROINTESTINAL TRACT

Enterogastrone and Urogastrone in Experimental Gastric Ulcers Produced by Phenol-Chinolin-Carbonic acid (L'enterogastrone e l'urogastrone nelle ulcere gastriche sperimentali da acido fenil-chinolin-carbonico). A. NASO. *Gior. ital. chir.*, 1953, 9: 103.

The authors review the literature on the experimental production of gastric ulcers. They chose to give phenol-chinolin-carbonic acid for the production of such ulcers. Altogether, 20 dogs were used and of these, 6 died soon after the experiments were begun. The remainder were divided into four groups. The first group consisted of 2 dogs used as controls. A larger number was not necessary as the experimental production of gastric ulcer by this drug has been proved by many authors.

The second group was given enterogastrone, while the third group was given enterogastrone and urogastrone as protective agents against the ulcer-producing drug. The fourth group was similar to the third except that a gastrostomy for collecting acid juices was made before the experiments were started.

The authors conclude that enterogastrone and urogastrone administered parenterally have a protective action against the experimental production of ulcers with phenol-chinolin-carbonic acid.

LUCIAN J. FRONDUTI, M.D.

A New Procedure for the Re-Establishment of Continuity After Total Gastrectomy by Interposition of a Segment of Intestine Between the Esophagus and the Duodenum (Un nouveau procédé de rétablissement de la continuité après gastrectomie totale par interposition d'un segment de grêle entre l'eosophage et le duodénum). ALAIN MOUCHET and MAURICE CAMEY. *Arch. mal. app. digest*, Paris, 1953, 42: 621.

Total resection of the stomach is often accompanied by grave functional and metabolic disturbances.

Digestive discomfort, the impossibility of taking adequate meals, the necessity of fractional feedings throughout the entire day, the "dumping syndrome," esophageal regurgitation, the disturbance of nutrition, emaciation, and anemia produce in the patient an extreme weakness which prohibits normal activity.

In order to prevent these disturbing complications, numerous surgeons have sought to re-establish the continuity of the digestive tract by a more physiological anastomosis.

In order to recreate a gastric pouch and re-establish the normal passage through the duodenum, the authors think that the simplest procedure is to interpose a segment of intestine, sectioned at both ends between the esophagus and the duodenum, with care to preserve the circulatory and nerve supply to this portion of the intestine.

This procedure was performed experimentally on the cadaver in 1951, and was performed on a living subject for the first time in France on February 9, 1953.

The second jejunal loop, supplied by the second intestinal artery, was chosen for anastomosis. The upper end was closed. An end-to-side anastomosis of the esophageal segment with the jejunal segment was performed; then an end-to-end anastomosis of the lower end of the jejunal segment with the duodenum was carried out. An end-to-end suture was used to re-establish the continuity of the jejunum.

All these anastomoses were performed with interrupted sutures in two layers, one through-and-through and the other seroserous. For the esophagojejunal suture, the seroserous and the through-and-through posterior sutures were placed before tying. The jejunal segment was led through the mesocolon by way of an opening made near the lower border of the pancreas.

Five patients have been operated upon by this technique. Two died during their postoperative convalescence. The others are living and have obtained remarkable functional results.

Although the mortality was high (40%) in the cases which have been reported, autopsy findings showed that it cannot be laid to the method of anastomosis. Fistulization of the esophageal suture and cardiopulmonary failure may occur after all types of total gastrectomy.

The only contraindication to the procedure described is the anatomical arrangement of the mesentery and high esophageal resection. If the mesentery is short and if the esophagus has been severed high up (above the diaphragm), this method of anastomosis becomes dangerous as the viability of the loop depends solely on its vascular supply. If viability is in doubt, it is best to abandon the method reported and re-establish continuity by some other method of anastomosis. In such cases the authors favor the Y type of Roux's operation with end-to-side anastomosis of the esophagus to the intestinal loop.

BLACKWELL MARKHAM, M.D.

Adenomatous Polyps of the Small Intestine. W. R. HUNTER and W. A. WILSON. *Brit. J. Surg.*, 1953, 40: 521.

The authors suggest the following classification of polypoid conditions of the small intestine:

1. True adenomatous polyps of the intestinal mucosa: (a) those associated with pigmentation of the lips and cheeks and having certain familial tendencies; (b) those not associated with pigmentation.
2. Polyps formed by heterotopic tissue.

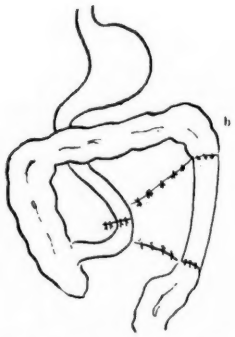

Fig. 1 (Parodi, Miglietta). Method of Nicoladoni.

3. Reactive hyperplasia of the mucous membrane, glandular tissues, and lymphoid tissues macroscopically simulating a true adenoma.

The true polypoid adenomas can be divided into two very distinct subsections, not because the pathology of the adenomas differ, but because in the one instance there is pigmentation of the mucous membranes and a definite familial tendency, while in the other no pigmentation is found and as far as is known there is no hereditary factor. Both types are uncommon. EARL O. LATIMER, M.D.

Concerning Plastic Surgery on the Large Intestine with Pedunculated Transplants; Ileocoloplastics and Ileocolorectoplastics (Sulle plastiche del grosso intestino con trapianto peduncolato di tenue. Ileocoloplastica e ileocolorettoplastica). LUIGI PARODI and MARCELLO MIGLIETTA. *Rass. ital. chir. med.*, 1952, 1: 195.

The authors review in detail the development of plastic procedures on the large intestine with pedunculated transplants of small bowel.

Four cases are reported in detail. In 3 of these ileocoloplasty was carried out after resection of the left colon and in the fourth case, ileocolorectoplasty was done after resection of the rectosigmoid for carcinoma.

In all, 55 of such operations have been carried out and the authors discuss the preoperative and postoperative care as well as the mortality rate, which approximates 10 per cent. GEORGE L. NARDI, M.D.

One Hundred and Thirteen Colectomies for Cancers of the Left Colon (113 colectomies pour cancers du colon gauche). JEAN QUÉNU. *Arch. mal. app. digest.*, Par., 1952, 41: 1025.

The author reports the cases of cancer of the left colon in which he and his assistants operated during a period of 27 years, from January 1, 1925 to December 31, 1951.

All cancers situated between the center of the transverse colon above and the rectosigmoid junction below are included.

Of 207 patients with cancer of the left colon seen by the author, only 113, or 54 per cent, underwent colectomies.

From 1925 to 1939, only 43 per cent of the author's patients were operated upon, while from 1940 to 1951, 60 per cent of his patients underwent colectomy.

The increase in operability of the patients during the latter period was due to three possible causes. The first cause was the fact that emergency operations for occlusion and peritonitis, having shown a decrease in mortality rate, left a greater number of these patients for colectomy. Second, the more exact methods of diagnosis (especially roentgenography) have brought the patients to operation at an earlier stage of the disease. Finally, the general improvements of conditions and operative success have recently permitted the author to consider colectomy justifiable on patients who were formerly classed as inoperable and subjected to only palliative operations.

Of the 113 patients operated upon by colectomy, 23 died (20% mortality).

Seventy-five of the colectomies were performed by the author with 9 deaths (12% mortality). Of the 38 patients operated upon by the author's assistants, 14 died (37% mortality).

During the period from 1925 to 1939, the operative mortality of the author was 11 per cent and during the period from 1945 to 1951 it was only 4 per cent.

The duration of hospitalization of the patients undergoing colectomy varied from 12 days up to a period of months.

More rapid cures were obtained in cases in which continuity was re-established immediately at the time of the operation. From 12 to 46 days, or an average of 24 days, were required to bring about recovery.

Multiple operations on the patient demanded 21 to 88 days, or an average of 35 days for recovery.

Postoperative complications survived by the patients, included 12 parietal suppurations, 3 urinary infections, 2 pulmonary emboli, 1 pleuropulmonary infection, 1 pulmonary tuberculosis, and 1 anal hemorrhage.

The majority of the complications, and notably the suppurations, have almost totally disappeared in recent years, probably because of the effect of antibiotic treatment.

The author believes that error in judgment was responsible for more of his failures than faulty technique. It takes longer to acquire experience than manual dexterity.

Shock is now better understood and more easily treated.

Pulmonary complications have become extremely rare, because of the quality of the anesthetics and the fact that patients are made ambulatory at an earlier date.

Anticoagulants prove efficacious in preventing venous complications.

The number of infections has been reduced by preoperative and postoperative treatment with antibiotics.

Immediate re-establishment of continuity after colectomy has reduced the mortality without increasing the operative risk.

The principal danger of the operation is nonunion of the anastomosis.

Of the patients followed up postoperatively, 28 have lived more than 5 years, 11 more than 10, 5 more than 15, and 3 more than 20 years.

Ten patients undergoing colectomy died 1 year or more after operation from causes other than the cancer for which they were operated upon.

Progress in the treatment of these cases is attributed to improvement in the methods of surgical treatment, in anesthesia, and in combating infection. These factors permit more daring interventions and produce milder postoperative convalescence.

BLACKWELL MARKHAM, M.D.

High Ligation of the Inferior Mesenteric Artery in Operations for Carcinoma of the Left Colon and Rectum. BJÖRN SNELLMAN. *Acta chir. scand.*, 1953, 105: 364.

The lymphatic vessels along the inferior mesenteric artery and vein constitute the chief route of spread in cancer of the rectum, while in cancer of the sigmoid and descending colon, they are practically the only route.

The majority of surgeons place the ligature distal to the left colic artery in order to insure a good blood supply to the ends of the bowel to be anastomosed. However, Bacon, Toupet, Ault, Grinnel and Hiatt, Wangensteen, and Lloyd-Davies have reported cases in which they had successfully ligated the inferior mesenteric artery proximal to the origin of the left colic artery without causing any appreciable rise in the mortality incidence. High ligation of the inferior mesenteric artery did not prevent their doing primary anastomosis or pull-through procedures.

Ligation of the inferior mesenteric artery proximal to the left colic artery cuts off the circulation from the middle of the descending colon to the sacral promontory. A fairly long segment of the colon, nearly half a meter, then needs to be resected, but this may be advantageous when polyps are present in the vicinity of the malignancy. In one of the author's cases, there were two malignant growths 10 cm. apart. By ligating the inferior mesenteric artery at its point of origin from the aorta, one can remove an additional regional lymph node area of relatively considerable size, and thereby make the resection more radical and effective.

The author presents 8 cases of successful high ligation of the inferior mesenteric artery, in which he was able to re-establish the continuity of the bowel after resection by mobilizing the splenic flexure and part of the transverse colon.

Because of vascular anomalies, this procedure cannot be used in all cases. One condition for a satisfactory performance of the operation is the adequacy of the marginal artery along the transverse colon. The author advises that the circulation in this area be ascertained by compressing the inferior mesenteric artery with the finger.

Because of the extent of the operation, the author does not do high ligation in the aged, the obese, and in those with diabetes, a weak heart, or with anesthetic complications.

EDWARD F. LEWISON, M.D.

Anorectal Suppuration. E. S. R. HUGHES. *Austral. N. Zealand J. Surg.*, 1953, 23: 41.

This article is based on a consecutive series of 50 anorectal abscesses treated at the Royal Melbourne Hospital or in private hospitals. These abscesses were classified as (1) perianal (40 cases), (2) ischiorectal (5 cases), (3) postsphincteric (3 cases), and (4) submucous (2 cases). A fifth type, the pelvirectal abscess, which is situated above the levator ani, was not encountered in this series.

The most common abscess, the perianal, is bounded inferiorly by the skin, superiorly by the perianal fascial septum, and medially by the anal canal; laterally, it is continuous with the subcutaneous tissue. The infection may therefore spread widely in the subcutaneous layer and discharge either through the perianal skin or into the anal canal. The most outstanding clinical feature is pain, which is usually severe and of short duration. The swelling is easily seen; it is surrounded by an area of cellulitis in the perianal skin.

The ischiorectal space is bounded above by the sloping roof formed by the levator ani, and below by the perianal fascial septum which separates it from the perianal space. Abscess here is uncommon. Pain is a lesser symptom, the patient being aware of a persistent discomfort in the region of the anal canal. Toxic symptoms are more obvious. On rectal examination a tense tender swelling is palpated outside of the anal canal, occupying one or both ischiorectal fossae.

The postsphincteric abscess occurs in the potential space posterior to the anal canal, between the coccygeal and cutaneous attachments of the superficial part of the external sphincter and the coccygeal attachment of the levator ani. The abscess is often small, but may spread into the ischiorectal fossa. Clinically, pain is not prominent, and the abscess is detected only by examination of the anal canal. A tender, circumscribed lump in the midline behind the anus is found.

The submucous abscess lies in the submucous space of the anal canal and adjacent rectum. A collar-stud abscess may extend into the perianal tissues, but the submucous abscess usually bursts spontaneously through the mucosa. It does not extend below the anal intermuscular septum, while the upper limit is above the anorectal ring.

The treatment preferred by the author for anorectal abscess is given in two stages. The first is incision and unroofing of the abscess. After healing

the condition remained quiescent in only 8 of 31 patients treated in this manner. In the remaining 23 there were persistent fistulas from the skin to the anal canal, which required excision. In these cases the authors recommend the application of a split-thickness graft at the time of excision of the fistula. JEFFREY FERRIS, M.D.

Malformations of the Anus. F. DOUGLAS STEPHENS. *Austral. N. Zealand J. Surg.*, 1953, 23: 9.

The three levels in the pelvis of the newborn male at which the common congenital abnormalities of the rectum and anus occur are the pubococcygeal line, the lower border of the ossified ischium, and a site approximately 1.0 to 1.5 cm. caudad to the ischium. The visceral levels which correspond to these skeletal sites are the bladder neck, the upper surface, and the lower and posterior aspects of the bulbocavernosus muscle. In the female, the intrusion of the muellerian ducts and vaginal bulbs causes a group of abnormalities which bears no constant relation to the middle level of the male. In the male, the common abnormalities correspond embryologically to the upper and lower ends of the endodermal cloaca. After subdivision of the cloaca, the anal membrane migrates caudally and posteriorly to the final site of the anal valves.

Under the classification of anal anomalies, the following types are considered: (1) imperforate anal membrane and stenosis, (2) imperforate anus, and (3) the covered anus group. The imperforate anal membrane occurs at the level of the anal valves, the lowest of the 3 levels. In the imperforate anus deformity, the cloaca is completely subdivided, but the anal pit is absent or rudimentary, and the rectum ends at the second level. The covered anus group occurs most frequently in the male and is due to abnormalities associated with excessive fusion of the genital folds which normally close in the urogenital sinus in the male.

In those anomalies which are not associated with skeletal abnormalities the levator ani musculature is well represented. The external sphincter in the imperforate rectum group was represented by only a sagittally arranged band of voluntary muscle fibers passing from the bulb to the coccyx. In the anal group, exclusive of the imperforate anus, the external sphincter consisted of only a thin, circular, deep band of voluntary muscle gaining attachment to the bulbocavernosus muscle anteriorly and a thin collection of sagittally arranged fibers passing from the coccyx anteriorly in the direction of the bulbocavernosus muscle.

The type of deformity and the level to which the terminal patent bowel descends in the pelvis must be determined before any surgical procedure is instituted. Roentgen-ray studies and inspection and probing of fistulas under anesthesia will furnish the diagnosis in most cases. The higher level imperforate rectum deformities are the most difficult to evaluate. The location of the terminal bowel may be in doubt on x-ray examination, in which case cystoscopy, laparotomy, and transverse colostomy with further lipiodol study may be necessary.

All those abnormalities lying at or below the lower border of the ischium may be treated surgically through the perineal approach as a primary measure. Treatment of the deformities at higher levels, including rectovaginal fistulas, should be preceded by a colostomy. For those in which the terminal rectum extends to the level of the pubococcygeal line, the sacrococcygeal technique is advised. Higher level deformities require preliminary abdominal mobilization and the sacrococcygeal approach.

A study was made of 30 cases of imperforate rectum deformities and 28 cases of anal deformity collected over a period of 5 years. Material for the study was obtained from the Hospital for Sick Children, London, Melbourne Children's Hospital, and Women's Hospital, Melbourne, Australia. In the imperforate rectum group, the sex distribution was equal, whereas males predominated in the anal group. There were 15 deaths in the imperforate rectum group, 10 attributed to an accompanying abnormality and 5 arising from surgical complications. In the anal group there were 6 deaths, only 2 of which could be considered postoperative. Deficiencies and abnormalities of the sacrum and coccyx occurred in 17 of the 30 patients with an imperforate rectum and in only 2 of the 28 with anal conditions. In 3 of the former and 7 of the latter group there was no information on this point.

In the majority of the cases in both groups, the genitourinary tract was not investigated. However, 13 of 16 cases in the imperforate rectum group, and 9 of 11 cases in the anal deformity group revealed genitourinary abnormalities.

The most severe deformities in the urinary tract occurred in the imperforate rectum group. Approximately 25 per cent of both groups were found to have other abnormalities. The 2 cases of associated tracheoesophageal fistulas and the single case of harelip support the belief that the abnormal development of imperforate rectum deformities occurs at the time of subdivision of the cloaca—between the 4 to 16 mm. stages of embryonic development.

HARVEY N. LIPPMAN, M.D.

LIVER, GALL BLADDER, PANCREAS, AND SPLEEN

The Intrahepatic Distribution of the Hepatic Artery in Man. JOHN E. HEALEY, JR., PAUL C. SCHROY, and ROBERT J. SORENSEN. *J. Internat. Coll. Surgeons*, 1953, 20: 133.

The intrahepatic distribution of the hepatic artery was studied by the authors by using the injection corrosion technique. The hepatic arteries were injected in 70 specimens, of which 40, or fifty-seven per cent, had a single hepatic artery entering the liver and 30, or forty-three per cent, had more than one artery entering the liver.

In all specimens with a single hepatic artery, it divided into a right and a left branch, the bifurcation

occurring anywhere from the hepatoduodenal ligament to the porta hepatis. The right hepatic artery coursed to the right of the hepatic duct in 87 per cent of the specimens and passed in front of the duct in 11 per cent. It terminated by dividing into an anterior and a posterior segment artery to the right lobe. This division may occur (a) in the hepatic parenchyma, (b) extrahepatically to the right of the common hepatic duct, or rarely (c) extrahepatically to the left of the common hepatic duct.

The posterior segment artery within the liver parenchyma joined the duct of the same name and divided into a superior and an inferior area branch. Variations in these branches occurred frequently. The anterior segment artery in the liver substance joined the anterior segment bile duct and divided into a superior and inferior area artery. There were variations here also. A subvesical artery also was found in a small number of instances.

The cystic artery was injected in 55 specimens and a single artery was found in 49. It arose from the right hepatic in 27 cases and from the anterior segment artery in 18 cases.

The left hepatic artery coursed obliquely upward and to the left for a short distance and then divided into a medial and lateral segment artery. Variations were numerous here also.

The medial segment artery usually arose as a terminal branch of the left hepatic artery. It then gave rise to four area branches, two superior and two inferior. There were four types of arterial supply as follows: Type I, in which the two inferior and the two superior arteries arose from a single medial segment arterial trunk (70%); Type II, in which three of the four area arteries arose from a single trunk and one from a separate site (20%); Type III, in which two superior and two inferior arteries came off as separate trunks (5%); and Type IV, in which two of the area arteries arose separately and two from a common stem (5%).

The lateral segment artery divided into superior and inferior area branches. In 35 per cent of the specimens, these arose from the left hepatic artery. Their courses followed much as in the case of the biliary duct arrangement. The arterial distribution to the caudate lobe was found to be extremely variable.

It is believed by the authors that atypical hepatic arteries, such as replaced and accessory hepatic arteries, are actually aberrant lobar arteries or aberrant segment or area arteries. No evidence was found of any gross intrahepatic anastomoses between the parenchymatous hepatic arteries. Arterial distribution within the liver followed closely that described for the biliary duct system. DONALD C. GEIST, M.D.

The Problem of Hepatolithiasis. A Study of 35 Personal Cases. N. FREDERICK HICKEN, A. JAMES MCALLISTER, and DEE W. CALL. *Am. Surg.*, 1953, 19: 695.

Hepatolithiasis is not a rare condition. In studies dating back to 1863, from 5 to 9 per cent of the patients with cholelithiasis were reported to have intrahepatic biliary calculi. The conditions which control the formation of stones within the extrahepatic biliary tree are in no way different from those which exist in the intrahepatic biliary system and thus the explanation for calculi in the larger ducts applies as well to those found in the smaller intrahepatic ducts. Hepatic stones are usually of the bilirubin-calcium variety and they vary in size, shape, and consistency, as do biliary calculi found elsewhere.

Intrahepatic calculi may be quite silent clinically or if symptomatic they cannot be differentiated with accuracy from calculi elsewhere in the biliary tract. Pain of a sharp colicky type, often radiating from the right upper part of the abdomen to the right shoulder, is characteristic. Febrile reactions are more common, chills occurring in about 25 per cent of the patients. Physical findings are usually not contributory although unequal enlargement of the liver lobules should suggest intraductal obstruction or deep-seated intrahepatic abscesses. Roentgenography affords the only method by which a preoperative diagnosis can be made and this is rarely of value. Localized calcification within the liver may be due also to calcifying hemangiomas, amebic abscesses, echinococcal cysts, gummas, tuberculomas, and neoplastic tumors.

Hepatolithiasis is usually not recognized until postoperative cholangiography is done or until autopsy is performed. However, certain clinical features should arouse suspicion at the time of operation, if treatment is to be instituted at the proper time. Experience has shown that if the common bile duct contains small stones, gravel, or plugs of inspissated bile pigments; if the hepatic bile is white or mucoid; if one segment of the liver is enlarged, cirrhotic, and bile-stained; or if an unexplained jaundice occurs in the presence of hepatomegaly, the possibility of hepatic calculi should be excluded. Operative cholangiography offers a simple and accurate method of excluding intrahepatic calculi. Displacement of the contrast medium, evidence of hydrohepatosis, or obstruction of a major duct will suggest their presence. In suspicious cases, forceful irrigation may dislodge small calculi and carry them into the operative wound.

The surgical extirpation of these stones may be very difficult and is often disappointing. An exploring instrument passed through the common hepatic or common bile duct can be used only blindly and thus ineffectively. Hepatotomy for intrahepatic calculi is difficult and unsatisfactory and, because of the multiplicity of such stones, highly impractical.

Conservatism has become, of necessity, the only practical approach to intrahepatic calculi which are discovered by postoperative cholangiography. When such a stone becomes dislodged, however, and if it subsequently obstructs the common bile duct, the indications for operative intervention are clear. In the authors' series of 35 patients with known hepatolithiasis, 15 have required subsequent operations for choledochal obstruction.

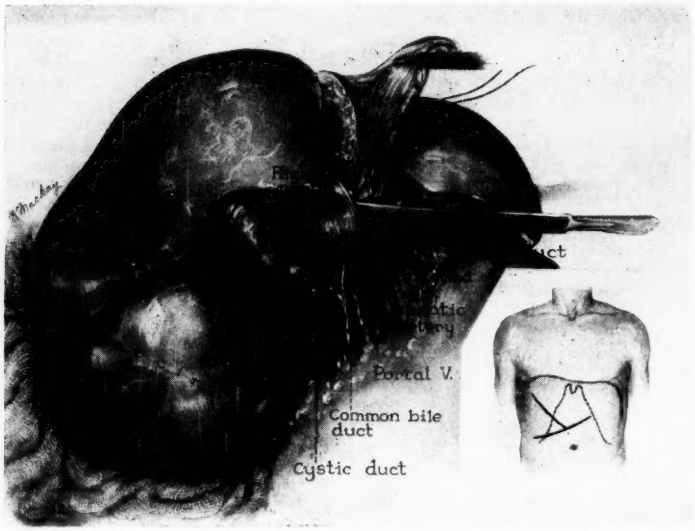

Fig. 1 (Quattlebaum). Resection of the right hepatic lobe. The cystic duct, cystic artery, right branch of the hepatic artery, the right hepatic duct, and the right branch of the portal vein are ligated and divided in the porta hepatis. The liver is incised with the handle of the knife which exposes the larger vessels without dividing them.

Chemical dissolution of residual calculi by solvents such as ether and alcohol is very distressing to the patient and disappointing to the surgeon. Biliary flushing as advocated by Best and his coworkers has also been largely ineffective in forcing calculi into the duodenum through the sphincter of Oddi.

In the authors' series of 35 cases of intrahepatic calculi seen and managed through the auspices of the Department of Surgery, University of Utah College of Medicine and the Latter Day Saints Hospital in Salt Lake City, a correct preoperative diagnosis was not made in a single case. The calculi were discovered by means of operative cholangiography in 51 per cent of the cases and by postoperative cholangiograms in 49 per cent. In 95 per cent of the cases, the calculi were multiple. They were found in both hepatic lobes in 51.4 per cent, in the left lobe only in 37.5 per cent, and in the right lobe in 11.4 per cent of the cases. HARVEY N. LIPPMAN, M.D.

Massive Resection of the Liver. JULIAN K. QUATTLEBAUM. *Ann. Surg.*, 1953, 137: 787.

Resection of the liver has been infrequently performed and total lobectomy has usually been confined to the left lobe. However, complete removal of the right and caudate lobes of the liver has been performed rarely.

Primary carcinoma confined to either lobe may be treated by wide excision or preferably by lobectomy. Hemangioma is the most commonly resectable liver tumor and it occurs in the liver more frequently than in any other organ of the body.

Adequate exposure is obtained by use of the transverse thoracoabdominal incision.

Hemorrhage is controlled by ligating the arteries, veins, and ducts of the lobe to be excised and dividing the liver close to the falciform ligament with the blunt handle of the knife. The larger vessels and ducts are ligated. The raw surface of the remaining liver is covered with a large sheet of gelfoam and the greater omentum and drains.

Three cases of massive resection of the liver are reported. Total lobectomy is advocated for primary carcinoma of the liver confined to one lobe. Solitary liver metastases should be removed at the time of the eradication of the primary lesion or as a secondary procedure in selected cases.

ERNEST D. BLOOMENTHAL, M.D.

Anatomy and Roentgenology of the Intrahepatic Biliary Ducts (Anatomie radiologique des voies biliaires intra-hépatiques). MARCEL ROUX, E. BERNIER, CH. DEBRAY, R. LE CANUET, and J. GARRET. *J. chir.*, Par., 1953, 69: 5.

While obtaining cholangiograms during operations on the bile ducts, the authors became aware of how useful these cholangiograms might be in the diagnosis of nodular lesions of the liver. A precise knowledge of the topography of the arborizations of the intrahepatic ducts could be of value to the surgeon.

This led the authors to undertake a serious study of the anatomy and roentgenography of the intrahepatic bile ducts.

The principal part of these researches consisted of laboratory experiments based on the study of the livers of 34 cadavers. Roentgenograms were taken at various intervals after the injection of an opaque contrast medium into the biliary canals by way of the common duct. Films were taken in series of the liver in situ and of pieces of liver taken from both of the lobes.

The contrast medium used was a mixture of finely divided powder in acetone to make a perfectly homogeneous liquid. A little ether was added to permit the injection to pass into the finely calibered intrahepatic ducts. It also afforded a rapid solidification of the mixture and thereby prevented the spontaneous evacuation of the contrast medium.

Pictures were taken of the liver in situ in the anteroposterior and lateral views; in both cases the point of origin of the hepatic duct was centered. Anteroposterior and lateral views of the extirpated liver were taken of the entire organ, and of the two lobes, after they were sectioned in the line of cleavage between them.

The roentgenograms were studied to determine whether or not there were any anastomoses between the elements of the left and right biliary systems. The biliary canals were found to be entirely distinct.

The roentgenograms revealed that there was no correlation between the external landmarks and the distribution of the intrahepatic ducts. All the elements situated on the left of the groove of the inferior vena cava, on the one hand, and of the bed of the gallbladder, on the other, were found to belong completely and exclusively to the left lobe of the liver. The mode of ramification of the intrahepatic ducts of the right lobe was found to be more complex than that of the left lobe.

The right lobe of the liver was found to be drained by two principal branches which formed the right hepatic duct. One branch was called the anterosuperior branch and the other, the posteroinferior branch, on account of their general directions. An intermediary branch was demonstrated, which most often was shown to originate from the anterosuperior branch. It was rarely shown to originate from the posteroinferior branch.

Each of the two main branches spread toward the periphery of the liver into smaller branches which were transverse to the axis of the main branch.

The anterosuperior branch was in direct continuity with the right hepatic duct, while the posteroinferior branch described a curve with its concavity downward, corresponding to the arch of the right portal vein.

The posteroinferior branch ordinarily jutted out on the left aspect of the anterosuperior branch to form the hepatic duct. It was found to be subject to variations.

The posteroinferior branch was sometimes found to be double. The two branches joined the anterosuperior branch, one following a typically epiportal direction and the other following a hypoportal direction.

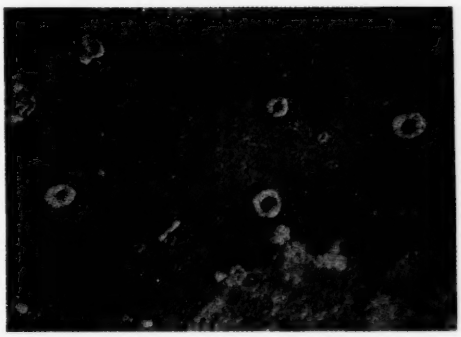

Fig. 1 (Mulè). Blood culture of a patient with carcinoma of the pancreas after inoculation of blood in meat broth containing 3 gammas of follicular fluid per cubic centimeter and cultured anaerobically under olive oil for 10 days. (×10,000 with electron microscope)

The posteroinferior branch sometimes joined the anterior branch at its point of confluence with the left biliary duct and then it appeared as a supernumerary bile duct.

The posteroinferior duct in its rarest form was found to join the left bile duct.

The left bile duct was found to be simpler than the right. It consisted of a main canal that divided into two branches near the periphery of the liver, one anterior and the other posterior. It had an almost transverse direction, more or less tortuous in character and joined the common duct at a right or an obtuse angle. BLACKWELL MARKHAM, M.D.

Observations with the Electron Microscope on the Blood of a Patient with Carcinoma of the Pancreas (Osservazioni al microscopio elettronico sul sangue di una ammalata affetta da epitelioma del pancreas). F. MULÈ. *Policlinico*, sez prat., 1953, 60:229.

The authors have carried out observations on the blood of a patient afflicted with carcinoma of the pancreas, using the electron microscope.

The blood was inoculated into liquid culture media containing follicular estrogens in olive oil, and in the allantoic liquid of a fertilized hen's egg. Varying periods of incubation were used and electron microscopy was carried out with chromium shading.

Morphological structures were found which at their maximum development had the appearance of saucers or racquets. These seemed to concentrate on the surface of the red cells of the patient and varied in size from 200 to 300 μ.

The blood of the patient was also inoculated into the chorioallantoic membranes of eggs and characteristic proliferative types of changes were observed with the presence of giant cells, granulomatous formations, and palisading of the cells.

These findings which were repeatedly reproducible were not observed in the blood of a normal control subject. GEORGE L. NARDI, M.D.

MISCELLANEOUS

Liver Nodules Encountered at Laparotomy: Significance and Treatment. CHARLES G. MIXTER and CHARLES G. MIXTER, JR. *Ann. Surg.*, 1953, 138: 230.

The evaluation of liver nodules found during the course of laparotomy frequently is based solely on the clinical impression gained by the surgeon through palpation, and less often through visualization of the suspected mass. This may result from insufficient exposure of the liver, inaccessibility of the mass, technical difficulty entailed in the biopsy of such lesions, or from the surgeon's belief in the infallibility of his judgment.

The liver is involved frequently in metastatic disease from the gastrointestinal tract. If the surgeon is to assess accurately the pathologic situation upon which he is to base the type of operation to be performed and the prognosis to be given, he must be aware of the exact nature of any palpable mass in the liver. He must perform a biopsy on all such lesions. Although experience has shown that the surgeon's ability to detect hepatic metastases is good, he is not infallible. In one series of 260 patients a false positive or suspicious diagnosis was given in 22.2 per cent of the cases.

The authors have presented case reports to illustrate the surgical principles which apply to the management of liver nodules discovered at operation.

1. Liver nodules found during the course of operations for benign conditions should be excised for biopsy at the time of operation in order to enable the surgeon to rule out metastatic disease even in the absence of a detectable primary lesion.

2. The discovery of liver nodules during the course of operation for malignant conditions presents a slightly different problem. Where a known malignancy exists, it behooves the surgeon to be certain of the nature of a liver nodule in order to be able to proceed with a curative operation rather than a palliative one if the suspected hepatic lesion proves to be benign. On the other hand, if hepatic metastases are proved to exist and no possible curative procedure can be undertaken, the surgeon may justifiably elect a less radical operation than he would if there was a reasonable chance for a cure.

3. In instances in which the inaccessibility of liver masses precludes their biopsy through the original incision, an extension of that incision, or a secondary incision, a needle aspiration biopsy, though often inadequate, may be attempted. However, when the primary lesion is malignant and no other evidence of distant spread is present, a curative operation should be performed even in those cases in which a specimen for biopsy cannot be obtained by these methods.

4. Resection of portions of the liver in cases of direct extension of malignant disease from neighboring structures has long been recognized as a feasible and practical surgical principle. Isolated blood-borne metastases to the lung, brain, and skeleton have been resected successfully. Solitary metastases to the liver have also been shown to occur and the evidence at present indicates that if no other distant spread can be demonstrated, and the primary lesion can be controlled, such lesions should be radically resected with the hope of a possible cure.

In those patients with or without known malignancy in whom a mass in the liver is discovered preoperatively by physical examination or other means, the treatment should be governed by the same principles which are applied to such lesions found at laparotomy. HARVEY N. LIPPMAN, M.D.

GYNECOLOGY

UTERUS

The Clinical Pattern of Intraepithelial Carcinoma of the Cervix and Its Pathologic Background. S. B. GUSBERG and DAVID B. MOORE. *Obst. & Gyn.*, 1953, 2: 1.

The authors review the development of the present concept of intraepithelial carcinoma. They give their criteria for diagnosis: namely, (1) loss of normal stratification and polarity, (2) atypical squamous cells which vary in size and shape with hyperchromatic nuclei and an increased nuclear-cytoplasmic ratio (very large deep-staining nuclei are common), (3) frequent mitotic figures, sometimes bizarre, (4) differentiation either absent or incomplete, and (5) complete replacement of the epithelium by these changes. There is usually a lymphocytic reaction in the stroma.

The material consists of the first 66 cases of intraepithelial carcinoma of the cervix treated at the Sloane Hospital for Women, New York. The material is reviewed with reference to incidence, age, and reproductive status. The methods of detection and diagnosis are given along with the signs and symptoms associated with the lesion. A review of 8 cases is presented, showing the course of the disease. A review of various methods of treatment is recounted along with the authors' method.

In summary, the authors state that only period examinations with Papanicolaou smear or biopsy will pick up this often silent lesion. They believe the external os to be the trigger site of this lesion and that extension on the canal side is more important than the portio spread. Basal cell hyperplasia frequently surrounds these lesions, as preinvasive cancer surrounds invasive cancer. Total hysterectomy in the patient who has had her family offers a direct means free of stress for eradication of a disorder which has a reasonable expectancy of later threatening her health or life unless she pursues a relentless program of observation.

BYFORD F. HESKETT, M.D.

Actual Situation of the Problem of "Preinvasive Carcinoma" of the Cervix (Lo stato attuale della questione del "carcinoma preinvasivo" della portio). M. TORTORA. *Arch ostet. gin.*, 1953, 58: 85.

After a review of the literature on preinvasive carcinoma of the cervix, with special reference to the diagnostic and therapeutic aspects of the lesion, the author reports the case of a para 2 of 39, who consulted him on account of secondary sterility.

The cervix had a normal aspect. The cervical scrapings gave a positive diagnosis of cancer but the biopsy was negative. Repeated cytologic examinations confirmed the original diagnosis and serial sections of the second biopsy established the presence of a preinvasive carcinoma.

The patient refused the operation. Elsewhere electrocoagulation of the cervix was performed. The patient became pregnant and had a normal delivery. Smears repeatedly made in the course of pregnancy were constantly negative. Two and a half months after the delivery, the colposcopic examination failed to reveal any suspicious lesion of the cervix. The smears and the Schiller test remained negative and endocervical curettage and ring biopsy did not disclose any alteration of the epithelium. Apparently, any carcinomatous epithelium which had remained after the patient's discharge from the hospital was subsequently destroyed by electrocoagulation. Thus, the patient avoided hysterectomy and was able to become pregnant.

Cytologic examination is the most reliable method of diagnosis of preinvasive carcinoma. If the histologic examination fails to confirm the diagnosis, a ring biopsy should be performed. This procedure should be followed by electrocoagulation to block the lymphatics and to accomplish hemostasis.

The treatment of choice consists of panhysterectomy with preservation of the ovaries in young women.

JOSEPH K. NARAT, M.D.

Observations on Lymph Node Involvement in Carcinoma of the Cervix. C. P. CHERRY, ALFRED GLUECKSMANN, RUTH DEARING, and STANLEY WAY. *J. Obst. Gyn. Brit. Empire*, 1953, 60: 368.

The authors studied the lymph node involvement of 213 patients with stage I and II squamous cell carcinoma of the cervix observed at the Queen Elizabeth Hospital, Gateshead. All were treated with radium and later by surgery. No roentgen irradiation was given. Lymph node metastases were found in 96 patients (45 per cent) at operation from 6 to 8 weeks after radium treatment. Errors in staging were found to be related to two clinical difficulties: assessment of the nature of parametrial thickening and determination of the degree of nodal spread. In fact, the latter was subject to an error of 33 per cent even by palpation at the time of operation.

Lymphatic drainage from the cervix to the common iliac and peri-aortic nodes occurs by two routes: (1) the paracervical, external iliac, and obturator groups, and (2) the hypogastric node group. In this series the anatomical pattern of lymphatic spread was evaluated in 91 node-involved cases. In 69 spread occurred via the external iliac and obturator route, in 5 via the hypogastric route, and in 10 via both routes. In 7 cases the pattern of node involvement was anomalous by omitting the proximal or intermediate node groups.

The incidence of lymph node deposits was found to be greater in stage II as compared with stage I, anaplastic as compared with differentiated tumors, and those seen in patients with residual cancer at the time of surgery. It is of interest also that residual

cancer was found more frequently with stage II than with stage I.

When the nodes were involved the extent and bilaterality of the lymphatic spread did not differ significantly in stage I and II cases. Anaplastic cancers involved the most distant regional groups of nodes to a greater extent than differentiated tumors. Bilateral spread was more frequent when the primary tumor persisted after radium treatment. These cases, too, showed more frequent involvement of the distant nodes. WARREN R. LANG, M.D.

The Present-Day Treatment of Cancer of the Corpus Uteri: Clinicostatistical Considerations with Reference to Surgical Therapy in the Period from 1926 to 1945 (La terapia attuale del concro del corpo dell'utero: considerazioni clinico-statistiche sul trattamento chirurgico nel ventennio, 1926–1945). GIAMPIERO AGOSTINO. *Ann. ostet. gin.*, 1952, 74: 1003.

Two hundred and three cases of cancer of the uterine corpus are here reported. This number comprises 59.35 per cent of the total number of such cancers observed (percentage of operability). The total number of corpus cancers (342 cases), in turn, comprises 15.91 per cent of the total number of uterine cancers (2,150 cases). Finally, the 342 uterine cancers represent 0.71 per cent of the total of gynecological admissions (47,558 cases) during a period of 20 years.

The primary mortality for the total group of 203 patients operated upon was 12.31 per cent; the percentage was relatively low in patients with stage I cancers (7.14 per cent), and rather high in those with stage II cancers (17.14 per cent); the primary mortality among those with stage III lesions was 23.81 per cent.

The percentage of deaths resulting from recurrence of the original tumor after 5 years was 31.70 per cent (24.49 per cent of patients with stage I cancers, 37.74 per cent of those with stage II cancers and 61.54 per cent of those with stage III). The deaths from recurrence after 7 years were 41.77 (31.92 per cent for patients with stage I cancers, 50.98 per cent for those with stage II cancers, and 61.54 per cent for those with stage III cancers). The deaths from recurrence after 10 years were 46.15 per cent (36.70 per cent for stage I cancers, 56.41 per cent for stage II, and 75 per cent for stage III).

The percentage of 5 year survivals for the entire operative material was 61.59 per cent (69.39 per cent for stage I cancers, 52.83 per cent for stage II cancers, and 38.46 per cent for stage III); the percentage of 7 year survivals was 48.73 per cent (59.57 per cent of patients with stage I cancer, 37.26 per cent of those with stage II cancers and 15.38 of those with stage III); 10 year survivals represented 40 per cent of the entire group: (53.17 per cent of patients with stage I cancer, 25.64 per cent of those with stage II cancer, and 0 per cent of those in stage III).

The 5 year survivals without additional postoperative irradiation treatment represented 60.08 per cent, the deaths from recurrence totalled 32.47 per cent. The respective percentages with such additional therapy were 68.82 and 29.35. The 7 year survivals without additional irradiation therapy represented 43.35 per cent and the deaths by recurrence represented 44.69 per cent; with such additional treatment the respective figures were 56.37 and 39.75 per cent. The 10 year survivals without additional irradiation therapy represented 37.28 per cent and the deaths from recurrence represented 48.38 per cent. With such additional treatment, the respective figures became 43.28 per cent and 48.75 per cent. There was not sufficient statistical material on patients irradiated preoperatively to warrant the publication of figures in this regard.

With reference to the different types of operative treatment, the best promise for the future seems to be offered by vaginal hysterectomy. In the author's series, this operation resulted in an operative mortality of only 6.07 per cent; the 5 year survivals totalled 70.97 per cent, and the percentage of deaths from recurrence during this period was 29.03 per cent; the 7 year survivals represented 46.67 per cent and the percentage of deaths from recurrence was the same; the percentage of 10 year survivals was 41.38, and the percentage of deaths from recurrence was the same.

Subtotal hysterectomy was accompanied by a high primary mortality (14.29%). This operation was usually reserved for desperate cases and, although the 5 year survival rate was 58.33 per cent, and the percentage of deaths from recurrence during this period was only 41.67 per cent, yet the percentage of 10 year survivals was only 9.09 per cent and the mortality which resulted from recurrence was 63.63 per cent.

In general, the Wertheim operation was regarded as too radical in character for these cases of carcinoma of the uterine corpus. This leaves for consideration only the hysteroadnexectomy of Freund. With this operation the uterus with its contained neoplasm is extirpated completely, with minimal trauma to the patient. The use of antibiotics has largely obviated the objection to this operation, viz., the greater danger of sepsis. With operation, the immediate mortality in the author's cases has been 11.59 per cent.

The figures here presented for survival and for deaths from recurrence are also encouraging. The percentage of 5 year survivals was 58.41 per cent, and the percentage of deaths from recurrence, 32.74 per cent during this same period; the respective figures for the 7 year survivals were 53.74 per cent and 37.71 per cent; the respective figures for the 10 year survivals were 43.80 per cent and 46.41 per cent.

In conclusion, the author recommends the hysteroadnexectomy of Freund, or the vaginal hysterectomy with complementary postoperative roentgen or radium irradiation therapy for the treatment of cancer of the uterine corpus in stage I.

JOHN W. BRENNAN, M.D.

ADNEXAL AND PERIUTERINE CONDITIONS

Elytrocele or Cul-de-Sac Hernia of the Floor of the Pouch of Douglas (Sull'elitrocele o ernia vaginale del fondo del Douglas). EUGENIO LENZI. *Clin. ostet.*, 1953, 55: 144.

A 48 year old female, engaged in heavy agricultural work, had undergone an anterior and posterior vaginal repair 23 years previously. One of her two pregnancies was terminated with forceps. The present complaint was the protrusion of the hernial sac, the size of an orange, outside of the vulval aperture, a tumefaction which was not at the time easily reduced. The scar in the anterior wall of the vagina was certainly effective in that there was no evidence of vaginal prolapse or of cystocele; however, it was excessively developed and had drawn the uterine cervix up to the symphysis. The posterior scar was not very long and involved only the lower portion of the posterior vaginal wall above the introitus vulvae. A barium enema and the introduction into the vagina, as far as the base of its prolapsed portions, of a specially curved wire demonstrated the fact that a rectocele was not present.

The posterior wall of the vagina and the adjacent perineum was incised and the elytrocele sac was easily isolated and followed up to the level of the uterosacral ligament, opened, and then tied off, and the suture was reinforced by a second row of sutures. Two ample triangular flaps of the vaginal wall removed from the sides of the original median incision restricted the size of the originally ample vaginal lumen to some extent. Particular attention was given to the suturing of the levator ani muscles, the margins of the vaginal wall, and the perineal incision.

The operative diagnosis was that of a sessile elytrocele (Brocq *et al.*) or vaginal hernia of the floor of the pouch of Douglas. Seven months later there was no sign of recurrence of the hernia.

In discussing the etiopathogenesis, the author suggests that the elytrocele may have been present but unrecognized at the time of the previous vaginal repair work. The failure to make the proper diagnosis then resulted in insufficient surgery which with the lapse of the years and the stress of heavy labor resulted in the development of the huge hernial sac described.

If, therefore, such a contingency can be assumed, and if there has in the past been a tendency to ascribe a posterior vaginal prolapse to a simple prolapse without the complication of the elytrocele, then the elytrocele may, in fact, be much more common than has generally been assumed, and it becomes imperative to emphasize the need for a correct diagnosis in these cases and the resulting need for adequate surgery.

Finally, the author calls attention to the possibility of prophylactic therapy, and he cites the recommendations of Meigs and others, who propose to approximate the uterosacral ligaments by appropriate suturing in every operation of hysteropexy or cervicopexy after subtotal hysterectomy by the abdominal route, in order to prevent a subsequent invagination of the cul-de-sac between the rectum and the uterine cervix. JOHN W. BRENNAN, M.D.

MISCELLANEOUS

The Relationship Between the Secretion of Pregnandiol During the Menstrual Cycle and the Histologic Picture of the Endometrium and the Ovaries (Beziehungen zwischen der Ausscheidung von Pregnandiol im mensuellen Zyklus und dem histologischen Bild des Endometriums sowie des Ovars). LEIF DIBBELT and RUDOLF BUCHHOLZ. *Geburtsh. & Frauenh.*, 1953, 13: 604.

Pregnandiol determinations by a specially sensitive method were made during the follicular phase of 11 regularly menstruating women. In each case a laparotomy was performed at the midcycle and the follicle was excised. The endometrium was obtained by curettage at the same time. In most instances a basal temperature chart was also kept.

In every case a follicle was found which was either ready to rupture or had already done so 1 to 2 days previously. In 9 of the 11 cases the pregnandiol secretion rose toward the end of the follicular phase and many times there was a preovulatory peak on the tenth day. The basal temperature chart showed a rise at this time in only 1 case. It is thought that the progesterone found before follicular rupture is made by the follicle itself.

WARREN R. LANG, M.D.

Secondary Dysmenorrhea. FREDERICK H. FALLS. *Am. J. Obst. Gyn.*, 1953, 66: 816.

Secondary dysmenorrhea can be differentiated from the primary type of dysmenorrhea rather easily in most cases by the nature of the pain and by the rather easily demonstrated pelvic disease. The pain is usually a dull aching and persists throughout the length of the period.

The author lists and very briefly discusses the various types of pelvic disease such as salpingitis, adenomyosis, endometriosis, ovarian disease, fibroids, cervicitis, cystitis, uterine displacements, and sacral nerve root neuritis.

ELY ELLIOTT LAZARUS, M.D.

The Modern Development of Androgenic Hormonotherapy in Diseases of Women (Die moderne Entwicklung der androgenen Hormontherapie in der Frauenheilkunde). ANGELO MIGLIAVACCA. *Geburtsh. und Frauenh.*, 1953, 13: 577.

The author presents the basis for the use of androgens in women. Their use is not unphysiologic since both male and female hormones are found normally in the female. Testosterone works both by its reflex action on the pituitary gland and by local effect, as in dysfunctional uterine bleeding in which it both depresses the gonadotropins and acts directly on the myometrium to produce hemostasis. The dose of parenteral testosterone should not exceed 250 mgm. per month, otherwise virilizing

changes might result. A recent derivative, androstendiol, has all the qualities of testosterone except the arrhenomimetic ones; therefore this compound is particularly of value when the male sex hormone is desirable for its anabolic action.

Other indications for testosterone include sexual frigidity, depressive neuroses, fibromyomas, endometriosis, premenstrual mastalgia, carcinoma of the breast, and the menopause. In the menopause, androgens may be combined with estrogens so that the undesirable sequela of the former (virilization) is prevented by the estrogens and the undesirable result of the latter (uterine bleeding) is prevented by the former. WARREN R. LANG, M.D

Carcinoma of the Genitalia in Women of Advanced Age; 1,169 Patients of More Than 60 Years of Age (Il carcinoma della sfera genitale nelle donne anziane; 1169 casi dai 60 anni in su). P. PARACCHI and L. LUCIANI. *Minerva gin.*, Tor., 1953, 5: 355.

At the National Cancer Institute in Milan, Italy, in the 20 year period from May 1, 1928 to April 30, 1948, 6,302 patients with gynecological disease were received. This material included 1,318 (21.8%) women more than 60 years of age, and the latter number included 1,169 (89%) women with malignant tumors of the genital organs. This particular material was selected in order to permit of a survival period of at least 5 years.

Observation of this material shows that a malignant tumor may develop, without reference to age, in any part of the genital organs of a woman, and it behooves the physician to be alert to such development in the old as well as in the young.

The incidence of malignant neoplasms of the portio still predominates even in the most advanced age; however, a special frequency is found to exist during this period for carcinoma of the vulva and of the body of the uterus. Of course, the figures adduced are only relative. In fact, the authors conclude that the usually assumed steady regress of genital incidence with advanced age is only an apparent one, resulting from the marked diminution in the number of those living to these advanced periods. The fact is that there is an uninterrupted progression in the increase in frequency of cancer of the female genitalia from the fortieth year of life.

The age of the patient does not in itself constitute a contraindication to a rational procedure in the treatment of cancer of the female genital apparatus; however, advanced age does demand prudence in the choice of the therapeutic procedure to be followed. Thus, for the patient who is more than 70 years of age, the preference for irradiation therapy is justified even in carcinoma of the portio in its earliest stages, since the fragility of the patient may more than balance the advantages to be anticipated from radical surgery. On the other hand, surgical removal of the new growth is to be preferred, despite advanced age, in the operable forms of malignant tumor of the corpus of the uterus and, pre-eminently, in malignant neoplasms of the vulva.

The course of the neoplastic process in the female genital apparatus is, on the whole, slower and less aggressive in its invasive propensities in the aged than in the young woman. Despite this lessened clinical malignancy in the aged, however, histologic examination does not evidence any appreciable difference in the appearance of the cellular architecture of the tumor cell with the lapse of the years; that is, there is no appreciable tendency for the cancer cell in the aged to present a more advanced maturity—there are just as many tumors with the fetal type of cell in the aged patient as there are in the young woman.

The prognosis for the malignant new growth in any region of the female genital apparatus in the aged patient is not (with the exception of that involving the vulva and the ovary) more somber than that for the homologous new growth for the younger life periods. The reason for the unsatisfactory results procured in the aged patients by the treatment (both radical and conservative) of malignant neoplasms of the vulva and of the ovary is not readily apparent. Of course, most of the poor results are to be ascribed to the advanced development of these growths in these patients when coming under medical care; however, the author can only speculate as to why these patients of advanced years tend to neglect themselves (prudery, fear, a neglectful attitude common to advanced age). Anyhow, the authors believe that the greatest gain for these aging patients with the danger of malignant degeneration of genital disease (kraurosis vulvae, cervical tears, and sclerosis) is to be anticipated from prophylactic therapy directed toward the precancerous lesions in aged women, lesions with an incidence which is almost concomitant with their advancing years.

In conclusion, the authors express the opinion that the relationship existing between cancer and senescence is one of great interest and one that merits an ever more profound investigation.

JOHN W. BRENNAN, M.D.

Multiple Tumors in Instances of Carcinoma of the Female Genitalia (Sulla molteplicità neoplastica nelle portatrici di carcinomi dell'apparato genitale femminile). HERBERT HUBER. *Riv. ostet. gin.*, Firenze, 1953, 8: 361.

Of the 4,078 genital carcinomas observed at the Obstetric and Gynecologic Clinic of the University of Kiel, Germany, in the years from 1922 to 1950, 199 (4.8 per cent) represented instances of primary multiple neoplasms. Of this number 63 consisted of a combination of genital and extragenital carcinoma and 136 were multiple in the genital tract itself. Of the 136 cases, 79 were symmetrical and 57 asymmetrical. This proportion of symmetrical growths is too important to be the result of mere chance and postulates some etiologic agent in these patients.

Another more than casual peculiarity is exhibited by the author's so-called systemic carcinoma of the

female genital organs. In this concept may be included the cancers of the corpus uteri, the tubes, the ovaries, and the structures arising from the ducts of Gaertner. Here the multiplicity is much more pronounced (10.5 to 40%) than in the carcinomas of the cervix, vagina, and vulva (0.3 to 1.8%). The cancers of the last mentioned three structures are nearly always the result of a local irritative process; these are, of course, structures arising from the tissues of the embryonal urogenital sinus. The more highly placed tumors, including those in organs derived embryologically from the coelomic tissues (ducts of Mueller), show a pluricentric origin and postulate a causal agent operating on the functional interdependence of the organs involved.

The carcinomas arising in the organs developing embryologically from the urogenital sinus, on the other hand, are seldom associated with other intragenital neoplasms.

Of the extragenital carcinomas most frequently associated with intragenital cancers, those of the mammary glands show an association with the discussed systemic cancers of the female genitalia which the author's figures show mathematically to be too frequent for the postulation of a merely casual relationship; it is suggested that the carcinomas of the mammary glands are functionally close to the systemic carcinomas of the female genitalia. In the matter of 5 year survival also, the so-called systemic carcinomas of the female genitalia seem to indicate a further interrelationship in that they are more benign.

Finally, the very rarity of the association of the cancers of the female genitalia arising on the basis of a local irritative process (vulva, vagina, portio) speaks for an actual state of antagonism between these neoplasms and the causal agent of the aforementioned systemic carcinomas of the female genitalia. JOHN W. BRENNAN, M.D.

Construction of a Vulvar Urethra for Selected Problem Cases of Urinary Incontinence. NORMAN F. MILLER. *Obst. & Gyn.*, 1953, 2: 107.

The author presents a new operation for certain problem patients with urinary incontinence. The technique briefly includes two stages at the present time: (1) construction of the new vulvar urethra up to, but not through, the bladder wall at or near the trigone, and (2) opening of the blind end of the newly formed urethra into the bladder with closure of the bladder opening or natural meatus. The technique is described. The advantages and the drawbacks are discussed. BYFORD F. HESKETT, M.D.

OBSTETRICS

PREGNANCY AND ITS COMPLICATIONS

Therapy of Placenta Previa Over a 50 Year Period. Are the Liberal Indications for Cesarean Section Justified? (50 Jahre Therapie der Placenta praevia: Sind wir mit der erweiterten Indikation zum Kaiserschnitt auf dem rechten Weg?) C. J. GAUSS. *Geburtsh. & Frauenh.*, 1953, 13: 481.

Cesarean section used to be employed by the author only in cases of total placenta previa or cases complicated by grave anemia, severe hemorrhages, or a closed or nearly closed cervix. The high postoperative mortality suggested that conservative treatment might be preferable because it spares the additional blood losses suffered during the operation. A review of the international literature for the period from 1900 to 1928 showed that the mortality in the series treated conservatively and that in the series treated by section was identical. Therefore, the author has further restricted the indications for section. While until 1931 the operation had been performed in 16 per cent of all cases of placenta previa, the percentage has sunk to 7.2 since that time.

According to the literature, section is being performed in various German clinics in from 7.4 to 54.9 per cent of all cases of placenta previa. The stricter the indications, the higher the maternal and fetal mortality. In the author's opinion there is no maternal indication for section. Moreover, the operation should not be considered if the fetus is dead or not viable. The fetal mortality following placenta previa for the period from 1915 to 1928 was 36 per cent, according to the international literature. The mortality in the group treated by indirect version, version and extraction, or metreurysis ranged from 34.2 to 70.7 per cent. In the series treated by rupture of the bag or in cases of spontaneous delivery, the figures ranged from 24.3 to 28.8 per cent. In the group in which abdominal section was performed, the fetal mortality averaged 9.1 per cent. Finally, the group in which vaginal section was employed showed a mortality of 18.6 per cent.

The author admits that, as far as the newborn is concerned, section offers the best prognosis. The operation is contraindicated if the fetus is dead, if labor starts earlier than 9 weeks before term, or if infection is present.

An attempt is always made by the author to have a spontaneous delivery, with or without rupture of the bag. The Willett forceps is widely used. If spontaneous delivery is unsuccessful and if the fetus is dead or not viable, indirect version is employed. If a live child is urgently desired, abdominal section is performed. Vaginal section has been given up because the operation is technically difficult and gives a poor prognosis for the newborn.

JOSEPH K. NARAT, M.D.

Maternal Afibrinogenemia Associated with Long-Standing Intrauterine Fetal Death. DUNCAN E. REID, ALBERT E. WEINER, CHARLES C. ROBY, and LOUIS K. DIAMOND. *Am. J. Obst. Gyn.*, 1953, 66: 500.

In the course of an investigation of the clotting mechanism in normal and abnormal pregnancy, it was noted that patients with dead babies in utero bled alarmingly at delivery. A study of these patients revealed a marked depletion of fibrinogen. It was suggested that diminished fibrinogen concentration was due to the possibility that "thromboplastic material from the uterine contents gained entrance into the maternal circulation and caused intravascular coagulation with consumption of fibrinogen." This condition occurred only when the fetus had been dead and retained in the uterus for a long time. Afibrinogenemia occurred prior to labor or as labor started, or when the patient was in active labor. There was no clinical or pathological evidence of premature separation of the placenta in any of the cases studied. The idea was offered that the myometrial contractions acting on the uterus in a sponge-like manner expressed coagulant material from the macerated uterine contents into the maternal circulation.

Acquired afibrinogenemia in pregnancy with a resultant hemorrhagic diathesis may be seen in at least three circumstances. These include amniotic fluid infusion (embolism), severe premature separation of the placenta, and long-standing retention of a dead fetus in utero. The significant hematological change is a defibrination of the blood. These changes are not related to alterations in prothrombic activity. Fibrinogen depletion is assumed to be the result of intravascular coagulation, caused by the escape of a coagulant, possibly thromboplastin, from the uterus into the maternal circulation.

The defibrinating material is supposedly derived from autolysis of the decidua or placental tissue. The coagulant enters the maternal circulation under the impetus of uterine contractions, whether they are of the Braxton-Hicks type or those of true labor. Placental autolysis following fetal death in utero varies greatly. Occasionally the placenta becomes devitalized to the point of liquefaction. It is in this situation that afibrinogenemia may develop.

Whenever alterations in the clotting mechanism are encountered or hemorrhagic manifestations appear, the patient should be hospitalized. Normal labor and pelvic delivery would appear to be the safer and preferred method of treatment in the patients whose hemostatic mechanism is disturbed. Whenever possible an obstetrical policy of expectancy should be pursued and the spontaneous onset of labor awaited. During the interim, blood transfusions may be required to correct any anemia.

In rare instances, recourse to abdominal delivery must be made. To avoid peritoneal contamination

when intrauterine infection is likely, rapid supracervical hysterectomy is advocated. Fibrinogen levels must be restored sufficiently to cause stable clot formation at the time of the onset of spontaneous labor or before any operative procedure is done. The administration of fibrinogen prior to this time is of little avail in restoring the normal blood levels since this substance continues to disappear from the blood under these circumstances until delivery has been effected. Moreover, the predelivery blood concentration of fibrinogen in these patients will be raised only temporarily by the administration of Fraction I.

During the time of labor or any operative procedure, the circulating blood volume should be maintained by transfusions, preferably of fresh blood, to insure adequate amounts of accelerator substances. If fibrinogen levels are maintained, intrapartum and postpartum hemorrhages are not anticipated. Moreover, afibrinogenemia will not recur following delivery. HARRY FIELDS, M.D.

Constriction of the Umbilical Cord by an Amniotic Band: A Rare Cause of Intrauterine Death. A. S. DUNCAN. *J. Obst. Gyn. Brit. Empire*, 1953, 60: 529.

The author reports, from the world's literature, 9 cases of intrauterine death caused by constriction of the umbilical cord by an amniotic band, and an additional case of his own. In each instance, an otherwise apparently normal fetus suddenly died in utero with no accompanying signs or symptoms other than cessation of fetal life. It is suggested that these cases provide additional evidence that certain limb deformities may be caused by amniotic bands.

ALAN RUBIN, M.D.

LABOR AND ITS COMPLICATIONS

Rupture of a Corpus Luteum Cyst During Labor. Report of a Case. KALEVI NIEMINEVA. *Ann. chir. gyn. fenn.*, 1953, 42: 109.

The author describes a para 3, 35 years of age, who at the onset of labor one week after estimated term, suddenly developed abdominal symptoms suggestive of an acute complication. During cesarean section the complication was found to be due to a ruptured cyst containing a thick tarry mass, which in the histological examination was established as an old corpus luteum cyst. The mother and the child made an uneventful recovery.

CHARLES BARON, M.D.

The Management of Breech Presentation. JAMES MAIR. *Lancet*, Lond., 1953, 265: 361.

When breech presentation is diagnosed, an attempt at cephalic version should be made between the thirty-fourth and thirty-sixth weeks of pregnancy.

The author attempts external version without anesthesia but with careful preparation of the patient beforehand, not forgetting also proper mental preparation. The patient rests in bed for an hour or so and is given morphine, gr. ¼ (16 mgm.) before the attempt at version. Recently, this morphine has been given intravenously a few minutes before version.

If version in these circumstances is unsuccessful, it is determined whether the case shall be dealt with as one of planned breech delivery or not. If breech delivery is contemplated, certain criteria must be satisfied. First, the legs must be extended (they nearly always are if easy version has failed). Second, the pelvis is carefully assessed, both clinically and also radiologically. If there is definite contraction or deformity of the pelvis, either version under anesthesia is attempted or elective cesarean section is performed at term. The choice of these alternatives when the pelvis is contracted and the breech presents will generally be made on the basis of the age and obstetric history of the patient.

There are cases, however, in which there may be a slight or borderline degree of pelvic contraction and the extended breech is engaged in the pelvis. In these cases version under anesthesia is also likely to be unsuccessful and, with a borderline pelvis, instead of cesarean section a trial of labor should be made when the breech presents. In such a case, if labor is allowed to progress until the cervix is fully dilated, in the absence of disordered uterine action or of maternal or fetal distress, and if the breech descends rapidly in the pelvis and appears likely to deliver itself spontaneously over the perineum, there will not be disproportion between the aftercoming head and the pelvis.

A birth weight below the dangerous level, and in most cases approximating the ideal, can be achieved by the surgical induction of labor at the appropriate time. The risk of dangerous prematurity from induced labor is very small, and it is not very difficult consistently to obtain by this method babies of reasonable size. Trial of labor is justified in the case in which there is a minor degree of contracted pelvis and in which version without anesthesia has failed and the extended breech is engaged. There is even more reason for the desirability of a baby of optimum size. Surgical induction should therefore be carried out, and if the breech fails to descend to the introitus, cesarean section remains perfectly feasible. One would not, of course, adopt this method in any instance except that of a quite minor degree of pelvic contraction.

The question of the elderly or relatively infertile primigravida requires consideration and is difficult. Although the results of breech delivery with this regime are good, these women must still be offered cesarean section for the sake of the baby.

It is wrong to insist too strongly on any therapeutic process, and it is more as a theme to be borne in mind that the plea is made for less external version and therefore more breech delivery, and that this breech delivery should always be planned and often preceded by surgical induction.

CHARLES BARON, M.D.

Dehiscence of Previous Uterine Incision at Repeat Cesarean Section. FRANCIS R. LANE and DUNCAN E. REID. *Obst. & Gyn.*, 1953, 2: 54.

The authors discuss cesarean section, its increasing incidence, relative safety, and the broadening of the indications for its use. They discuss at length the various controversial problems connected with its use, the type of operation, and the repetition of its use with subsequent pregnancies. The special problem for discussion deals with dehiscence of previous cesarean section scars at the time of repeated abdominal hysterotomy.

The records for 12 years at the Boston Lying-In Hospital were critically reviewed, as were a random series of cesarean sections at a private service. Some of the literature is reviewed and discussed. It is the authors' impression that the literature does not express the true picture of uterine wound dehiscence, partly because bad results are frequently not reported and because thin scars or openings in the uterus are not reported as ruptures.

A discussion is included of the indications and conditions for repeat cesarean sections and vaginal delivery. A review of the literature on uterine wound healing is presented as well as of the method of wound closure during section.

The authors conclude that the incidence of uterine wound dehiscence, or rupture, approaches 3 per cent and that the type of incision does not seem to influence this incidence. Rupture of the classical variety is more apt to occur during the last trimester rather than in labor. The reverse is true for the lower uterine incision.

The authors believe the classical variety is less apt to rupture during labor than is the lower uterine segment type. They draw attention to the fact that often when no evidence pointing to rupture in the scar is presented, rupture is found at operation.

Finally, they conclude that because of their findings the dangers of pelvic delivery following lower segment operation outweigh the present day risks inherent in repeat cesarean section.

BYFORD F. HESKETT, M.D.

MISCELLANEOUS

Studies on the Vascularization of the Human Placenta. FINN BØE. *Acta obst. gyn. scand.*, 1953, 32: Supp. 5.

On completion of their parallel course in the umbilical cord, the umbilical vessels divide up into a number of main vessels which run radially, and approximately parallel out through the chorionic plate, giving off smaller vessels. The arteries and the veins run in separate sheaths formed of chorionic tissue. On entering the chorionic plate the arteries lose their muscular coat and increase considerably in diameter.

Leaving the chorionic plate, the vessels meet again in the fetal stems, one artery and one vein running axially in each stem (stem vessels). The arteries are more superficial than the veins. The main stems (truncus) issue along the course of the main vessels in the chorionic plate and the branches of these.

In the early placenta, the stem vessels divide and continue axially in the tertiary villi (main vessels), the arteries being more superficial than the veins. The branches of the main artery subdivide into a superficial capillary network which vascularizes the syncytial buds on the surface of the villi. Only a few of these buds, i.e., the larger, have a separate artery leading from the main artery. A similar capillary network occurs in the surface of the stems and this is vascularized from the branches of the stem vessels. This capillary network will be found in every functioning villus, but is not so universal in the stems. At a more advanced stage of pregnancy (16th to 20th week), the arteries which branch out into the superficial capillary network have a marked elongated course, frequently retrograde (against the direction of the blood stream). They are few in number. The superficial capillary network has separate outlets to the main (or stem) vein. These venous outlets are considerably more in number than the branches of the main artery; they take the form of short venulae, are noticeably thicker than the capillary vessels, and enter the main vein at right angles.

Most villi attach themselves as anchoring villi to the basal plate where the vessels end blindly, but a considerable number of them terminate freely in the intervillous space. The tertiary villi are interconnected by means of a general system of fibrinoid tissue (regressively transformed villi attached to trophoblast islands). Truly free villi are, therefore, practically nonexistent. As fibrinoid tissue is not vascularized, each villus is a vascular unit.

About midpregnancy, the tertiary villi disappear and are replaced by stems (anchoring stems) from which the definitive villi issue. The vascularization of the anchoring stems resembles that of the tertiary villi. The definite villi are much smaller than the tertiary and of a different gross appearance.

In the mature placenta, the chorionic tree in each cotyledon consists of one main stem or the foot of the tree (truncus chorii), which ramifies into major stems and their branches (rami chori) including the anchoring stems and minor stems (ramuli chorii). The majority of the terminal branches and chorionic villi issue from the minor stems. These structures may, however, appear anywhere on the chorionic tree, but they rarely issue directly from the chorionic plate (as tertiary villi do).

Terminal branches and villi are vascularized partly by means of separate branches from the stem vessels, and partly from the superficial (paravascular or subsyncytial) capillary network.

The branches of the stem vessels form a superficial vascular net in the stems. In this net the arteries and the veins have different patterns. The arteries have an elongated course parallel to the

stem vessels, either in the direction of the blood stream or in the retrograde direction, before entering the (larger) villi or terminal branches to form the main artery in these structures. The veins, on the other hand, take the shortest route to the stem vein or to its branches.

The branches of the stem arteries give off a limited number of capillary supply vessels to the paravascular capillary network which is an elongated system of intercommunicating arteries of the size of capillary vessels. This system has separate outlets to the venous system (arteriovenous communications). These outlets are quite short and more in number than the supply vessels from the stem artery.

Only terminal branches, complex villi, and larger simple villi have separate arteries (branches from the stem artery). Smaller simple villi and the minor chorionic structures receive their blood supply solely from the paravascular capillary network. The larger structures, which have a separate artery, receive an additional supply from the paravascular capillary network; this network is, therefore, of importance for the vascularization of every single functioning villus. Most villi, including the smaller simple villi, usually have a separate vein. It is thus possible to distinguish between three types of vascularization:

Type 1. The major chorionic structures: separate artery plus supply from the paravascular capillary network, separate vein.

Type 2. Medium-sized villi: supply from the paravascular capillary network, separate vein.

Type 3. The minor chorionic structures: supply from and outlet to the paravascular capillary network.

Terminal branches are vascularized as in Type 1.

The branches from the main vessels in complex villi and terminal branches once again show a different pattern for arteries and veins. In the neck of the complex villus, the main artery divides into a number of minute branches which follow a rambling course, apparently a branch of this type leads to each single villus in the complex villus. In addition, the artery gives off supply vessels to the paravascular capillary network, which in turn extend throughout the complex villus. The smallest veins take the shortest route to join the larger veins, which in turn unite to form the main vein. In a terminal branch, the main vessels run parallel throughout the entire length of the branch. The main artery gives off supply vessels to the paravascular capillary network in the mother stem, which in turn sends out off-shoots up through the terminal branch. The branches of the main artery do not differ in size from the vessels forming the paravascular capillary network in the terminal branch; therefore, they appear identical. From this capillary network, villi issuing along the course of the terminal branch are vascularized. The veins show their characteristic pattern (right-angled entry into the main vein).

It is not unusual for the main artery to subdivide into several fine, parallel branches before entering the complex villus or the terminal branch which, in such cases, lacks a true main artery. A similar pattern may also be found in the larger arteries (stem arteries), which will then subdivide before, while the veins subdivide simultaneously with, the stems.

The characteristic difference between the patterns of the arteries and veins and the pattern of the paravascular capillary network itself will appear chiefly in the minor stems (ramuli chorii) as the majority of villi and terminal branches issue from these.

The minute superficial arterial branches (rambling arteries) and the vessels leading from the paravascular capillary network carry blood to the capillary network in the chorionic villi. This capillary network has the appearance of an elongated, fenestrated reticulum with sinusoid expansions and narrower communications. These sinusoid capillaries are characteristic of the villi capillary network. The supply arteries have a noticeably smaller diameter than the capillaries themselves. From the capillary network the blood collects in a centrally situated vein.

The increase in diameter of the umbilical arteries when entering the chorionic plate, the predivision of the arteries inside the stems, the elongated course of the branches of the stem arteries, the structure of the paravascular capillary network, the smaller diameter of the supply arteries than that of the sinusoid expansions in the villi capillaries—all these peculiarities of the arterial pattern would seem to be part of a mechanism designed to reduce the rate of the fetal blood stream. The direct connections between the paravascular capillary network and the venous system (the arteriovenous communications) are assumed to form the anatomical basis of a shunt mechanism. It is believed that a slow blood stream is necessary to enable the interchange of materials between the fetal and the maternal circulations to be carried out satisfactorily.

Experiments based on filling the intervillous space with Indian ink indicate that the uteroplacental arteries enter the space through the center of the cotyledons. These experiments thus support Spanner's theory and contradict the view held by Bumm, and later by Stieve, that the arteries enter through the septa.

As the outlet of the uteroplacental arteries lies in the center of the basal cover of the cotyledon, and the main stem of the chorionic tree (truncus chorii), lies similarly in the center of the opposite side, the maternal and the fetal blood will flow directly toward one another, a characteristic which has been found to apply to all types of animals which have been examined.

The Indian ink experiments indicate that the maternal blood spreads concentrically outward in the cotyledon from the arterial outlet. However,

the course followed by the maternal blood in the intervillous space requires further research. The placental septa which border the cotyledons form a definite barrier to the maternal blood. But septa seldom, if ever, reach down to the chorionic plate. It is, therefore, possible that the maternal blood can flow from one cotyledon to the other in the subchorionic space. The present researches have not, however, led to any results which make it possible to assess the significance of this possibility for communication, except that the subchorionic reticulum is a dense structure and, therefore, not likely to allow the penetration of much maternal blood. It is, therefore, well possible that Bumm's old hypothesis, that the cotyledon is a maternal vascular unit, may be correct, but with the maternal vessels having a different course than that indicated by him.

The very tortuous course of the long and narrow maternal uteroplacental arteries causes a reduction in the rate of the blood stream, and a further considerable reduction of rate and blood pressure is brought about when the narrow arteries empty their blood into the intervillous space as in a large basin. In other words, the maternal circulatory system comprises a mechanism similar to the more complicated corresponding mechanism in the fetal circulatory system. CHARLES BARON, M.D.

An Assessment of the Value of the Chassar Moir Graphs in the Roentgenological Investigation of Cephalopelvic Disproportion. JOHN P. ERSKINE, GOEFFREY KELHAM, and PETER P. WIUM. *J. Obst. Gyn. Brit. Empire*, 1953, 60: 312.

The authors report a 2 year experience with Chassar Moir x-ray pelvimetry graphs at the Paddington Hospital, London. They feel that the method is uncomplicated yet sufficiently accurate and valuable for routine use.

One hundred and sixty consecutive patients with suspected cephalopelvic disproportion were studied and subdivided into four groups according to the roentgenological findings. An assessment was made of the accuracy of the predictions of the radiologist. The over-all accuracy was 91.6 per cent of the total.

In group I, with no disproportion, there were 106 patients of whom 101 delivered vaginally (95.3% accuracy). In group II with minor disproportion, or disproportion of not more than 2 mm. on the brim chart, or of not more than 4 mm. on the cavity or outlet chart, there were 25 patients, but only 20 were assessable since cesarean section was performed on 5 for indications other than disproportion. All 20 delivered vaginally, only 3 requiring the aid of forceps. In group III, with moderate disproportion, or disproportion of more than 2 mm. but not more than 4 mm. on the brim chart, or of more than 4 mm. but not more than 7 mm. on the cavity or outlet chart, there were 13 of whom 9 were assessable. Of the 9, 4 delivered spontaneously, 3 with the aid of forceps and 2 with cesarean section after a trial of labor. There were 16 patients in group IV with severe disproportion, or disproportion of more than 4 mm. on the brim chart or of more than 7 mm. on the cavity or outlet chart. In this group, 1 delivered spontaneously, 3 with the aid of forceps, and 12 with abdominal section.

In the series of 160 patients 7 had stillbirths and 2 had neonatal deaths. One had multiple congenital abnormalities, one had prolapse of the cord, and 2 died before the onset of labor. Two were delivered with the aid of forceps, 1 had a breech delivery, and 1 died following section for uterine inertia and fetal distress. One child was stillborn following a spontaneous delivery. WARREN R. LANG, M.D.

Blood Volume Variation During Labor and the Early Puerperium. HOWARD J. TATUM. *Am. J. Obst. Gyn.*, 1953, 66: 26.

The technique utilized in this study consisted of a 10 minute "sample method" with T-1824 dye described by Gregerson. The patients all had spontaneous deliveries without premedication and were delivered when necessary under local procaine infiltration.

The patients were divided into four groups—the first of which were subjected to the test 4 hours prior to delivery of the placenta. In the second group the determinations were made in the 30 minutes before and 30 minutes after delivery of the placenta. The third group of patients were tested 4 hours after delivery, and the fourth group, from 18 to 26 hours after delivery of the placenta. Determinations of the actual plasma volume were made, averaged, and expressed in cubic centimeters per pound of body weight.

The second portion of the investigation concerned a group of 8 patients who were subjected to elective cesarean section. In this group determinations were made 1 hour prior to the operation, after the bladder flap had been dissected, and immediately after the uterus was opened, and the final determination was made approximately 4 minutes after the placenta had been delivered.

These determinations showed a rather marked rise in plasma volume late in labor, reaching a peak just about the time the placenta was delivered. This was followed by a rather abrupt fall with a continued but slower drop over the next 18 to 26 hours. On the basis of the average patient weighing 150 pounds, the increase amounted to 3.9 c.c. per pound, or a total of 580 c.c. It was noted that the packed cell volume did not vary and on this basis the total increase in blood volume would amount to 900 c.c. Again, on similar calculations following delivery of the placenta, the decrease in the whole blood would amount to 1,320 c.c.

It was interesting to note that in the cesarean patients there was no elevation in the plasma volume, and the decrease in plasma volume in the early puerperium revealed a somewhat slower, but actually a more marked, decrease in the plasma volume.

In the discussion of the data, apparently the changes in the plasma volume cannot be accounted for by the amount of blood circulating in the uterus

and an adequate explanation is not as yet available. Clinically, there is an apparent parallelism between the maternal death rate of cardiac patients and the plasma volume level, or at least the rate of increase of plasma volume level.

JAMES F. DONNELLY, M.D.

Measurement of Uterine Blood Flow and Uterine Metabolism. N. S. ASSALI, ROY A. DOUGLASS, WILLIAM W. BAIRD, D. B. NICHOLSON, and ROY SUYEMOTO. *Am. J. Obst. Gyn.*, 1953, 66: 11.

Following a brief description of the blood supply to the uterus, the technique for catheterization of a uterine vein via the brachial vein, heart, and inferior vena cava is described in detail. A long Courand single lumen 8F or 9F catheter is inserted into the brachial vein and passed into the right atrium. Under fluoroscopic control this is guided to the opening of the inferior vena cava down through the common iliac, hypogastric, and, finally, the uterine veins. Arterial puncture is performed on the brachial or radial arteries, either by direct puncture or by cutting down the vessel. The uterine vein may be isolated during abdominal surgery and cannulated directly with arterial blood in the previously described fashion. With the uterine vein cannulated and a source of arterial blood available, the nitrous oxide and dye techniques previously described by the same author can then be utilized to determine the rate of uterine blood flow.

It was pointed out that patients must be carefully selected and advised of the procedure which is to be performed. When the catheter reaches the heart, frequent electrocardiograms are taken to record any arrhythmias which develop—these being fairly common complications. In addition, there is the possibility of pulmonary embolism which has occurred but is rarely seen.

The chief difficulty of the catheter technique is that the failures greatly exceed the number of successful cannulations; also there is a risk of excess irradiation from the repeated fluoroscopic examinations, which can be kept at a minimum by reducing the number of direct cannulations of the uterine vein. During abdominal surgery the technique is somewhat restricted by the amount of time available for repeated observations.

The accuracy of the method depends a great deal upon precise timing of the withdrawal of the blood samples. The advantages and disadvantages of each of the techniques are discussed.

JAMES F. DONNELLY, M.D.

Intravascular Clotting and Afibrinogenemia, the Presumptive Lethal Factors in the Syndrome of Amniotic Fluid Embolism. DUNCAN E. REID, ALBERT E. WEINER, and CHARLES C. ROBY. *Am. J. Obst. Gyn.*, 1953, 66: 465.

In studying cases of amniotic fluid embolism it was noted that some patients died undelivered with the classical signs and symptoms of embolism, while others survived the initial shock and succumbed within 1 to 3 hours after delivery. In the latter group bleeding from the mucous membranes and organ surfaces was noted, and some degree of vaginal bleeding was described which was attributed to atony of the uterus, secondary to shock. When these fatal cases were reviewed, two unusual observations stood out. One was to the effect that the amount of mechanical blockage of the pulmonary vessels by amniotic debris was hardly sufficient to be the cause of death in every instance. The other was that the blood was liquid at postmortem and clotting of any degree was rarely seen. The cause of death in this syndrome, therefore, appears not to be explained in all cases by the effects of embolism alone. This suggested that the presence of amniotic fluid in the systemic circulation might somehow be related to the coagulation difficulties.

The presence of significant amounts of thromboplastin in the amniotic fluid suggested that death in this syndrome could be ascribed to causes other than mechanical blockage from amniotic fluid debris. The postulate is offered that death in this syndrome might result from either extensive intravascular clotting or subsequent postpartum hemorrhage. Death from hemorrhage is regarded as the result of afibrinogenemia, the end result of the effect of extreme intravascular clotting.

In the absence of a blood fibrinogen concentration necessary for effective hemostasis (100 to 150 mgm. % or more), clot formation at the uteroplacental site would be deficient and a lethal postpartum hemorrhage would eventuate.

Detection of afibrinogenemia by the "clot observation test" and timely fibrinogen replacement in the form of Fraction I would prevent many maternal deaths in amniotic fluid embolism. The diagnosis of amniotic fluid embolism is rather frequently made when sudden obstetrical death occurs. In such circumstances, faulty anesthesia or cardiac failure has been shown on more than one occasion to be the true cause of death. Many pathologists found it difficult to correlate the findings in the lungs which are often minimal with a respiratory form of death. The sequential changes which occur in this syndrome are understandable, however, if one considers that amniotic fluid has a thromboplastic effect.

When a nearly pure preparation of thromboplastin is rapidly infused intravenously into dogs and cats, death soon follows, but if it is administered slowly the animal will survive and defibrination of the blood will occur. The introduction of amniotic fluid into the maternal blood stream may cause a state of incoagulability of the blood to develop. Because of this the term amniotic fluid embolism is not descriptive and the syndrome might better be referred to as "amniotic fluid infusion."

The fact that the syndrome occurs near the end of the first stage of labor in the majority of instances suggests that a certain set of circumstances is needed for its development. These include both

an available portal of escape and the forceful ejection of the amniotic fluid from the uterus. With respect to avenues of entrance of amniotic fluid into the maternal circulation there are two possibilities. The commonly accepted manner involves a rupture of the membranes somewhere in the upper segment of the uterus, with eventual escape of the fluid through the uteroplacental site.

The amniotic fluid may also escape from the uterus into the maternal circulation following the rupture of the fetal membranes. The amniotic fluid may dissect between them and the uterine wall, and in rare instances reach the placental margin to enter the venous sinusoids and systemic circulation. The process is apparently expedited through the influence of vigorous uterine contractions. The escape of the fluid from the uterus is enhanced by those conditions in which the uterine vessels are opened abnormally as in rupture of the uterus, cesarean section, marginal separation of the placenta, and normal separation with partial placenta accreta.

The second and undoubtedly the more frequent outlet for the fluid is through the endocervical veins. These blood channels become lacerated during normal labor and account for the appearance of "bloody show." As some of the endocervical veins may be included in the lower uterine segment and not be covered by fetal membranes, the amniotic fluid may come in contact with the myometrium. Were the fetal vertex to tamponade the cervix, intrauterine pressure might increase sufficiently as the result of tumultuous labor to allow the trapped fluid to enter the uncovered endocervical veins of the lower uterine segment.

When large amounts of thromboplastic material are introduced suddenly into the blood stream, the resultant intravascular coagulation will lead to sudden death. However, when the amniotic fluid enters more slowly and over a longer period of time, it is postulated in the human being, based on experimental evidence, that the blood will become defibrinated. While hemorrhage in the defibrinated experimental animal occurs only after trauma, in the obstetrical patient an already open wound is available, namely, the placental site. In the presence of a clotting defect, arterial and venous decidual vessels will fail to thrombose and uncontrolled bleeding will ensue. Since the primary defect is a low concentration of circulation fibrinogen, this may be readily restored by the administration of Fraction I while any secondary alterations in the clotting mechanism are corrected by the use of fresh whole blood transfusions.

Recovery will ultimately depend upon the restoration of normal blood fibrinogen concentrations by the administration of fibrinogen (Cohn's Fraction I). The amount of fibrinogen required should be equivalent to that contained in the circulating blood (8 to 12 gm.) for theoretically complete defibrination is possible. A minimum of 4 gm. is necessary.

HARRY FIELDS, M.D.

GENITOURINARY SURGERY

ADRENAL, KIDNEY, AND URETER

Adrenal Surgery for Cushing's Syndrome. EUGENE F. POUTASSE and CHARLES C. HIGGINS. *J. Urol.*, Balt., 1953, 70: 129.

It is now generally believed that all patients with the clinical syndrome which bears Cushing's name have hyperadrenocorticism. In some instances this is caused by a tumor of the adrenal gland, but more often it is caused by hyperfunction of the adrenal cortex, with or without hyperplasia. The many physical and metabolic changes are caused by excess production of 11-oxysteroids by the adrenal cortex. The two main steroid hormones involved are corticosterone and 17-hydroxycorticosterone which are excreted in the urine as 17-ketosteroids and corticoids. An excess of either or both of these excretory products can be shown by proper biochemical tests of the urine.

Among the characteristic features of Cushing's syndrome are the round red face, hirsutism, obesity of the trunk and neck, purplish striae, hypertension, diabetes, osteoporosis, and mental instability. Most of the features of Cushing's syndrome can be produced by the prolonged administration of adrenocorticotrophic hormone, which stimulates the adrenal gland, or with cortisone or compound F.

In a series of 28 patients with Cushing's syndrome, 2 were found to have a malignant adrenocortical tumor, 4 had a solitary adenoma of the adrenal gland, 2 had small adenomas in otherwise hyperplastic adrenal glands, and the remaining 20 were found to have normal-sized or enlarged adrenal glands on exploration. The size of a gland does not necessarily bear a direct relationship to its functional capacity. In making a diagnosis of adrenocortical hyperplasia, the pathologist looks for rounded nodular gland edges, an increase of cellular elements, and an increased fuchsinophilic staining reaction.

In recognition of the syndrome, certain laboratory and roentgen findings supplement the previously enumerated clinical features. The glucose tolerance test is almost invariably compatible with diabetes mellitus. A few patients show alteration of the serum electrolytes, with a low serum potassium, low chloride type of alkalosis, and elevation of the serum sodium. The electroencephalogram will often reveal an abnormal pattern. Hypertension is common, as is osteoporosis involving chiefly the skull, ribs, and vertebrae. Excretory urography may show downward displacement or outward rotation of the upper pole of the kidney. Perirenal gas insufflation, spot films at the level of the adrenal gland for soft tissue detail, and translumbar aortography are of further aid.

Adrenal exploration on 3 of 4 occasions in Cushing's syndrome will reveal hyperplastic glands. According to the present concept, one entire gland and most of the opposite adrenal is removed, a fragment containing the arterial supply and the central vein being spared. This can be done readily in one operation, preferably under constant spinal anesthesia, by means of Young's approach for posterolateral incision and excision of the twelfth rib.

Operative stability is provided by administering 100 mgm. of cortisone intramuscularly about 12 hours beforehand, repeated again a few hours before operation. Postoperatively this is continued in 50 mgm. doses every 6, 8, or 12 hours, as needed. Within 3 to 6 weeks there should be no further need. Signs and symptoms of adrenal insufficiency include nausea and vomiting, weakness, muscle pains or stiffness, hypotension, or unexplained fever. Blood electrolyte values must be followed up because serious alteration of the serum sodium, potassium, chloride, and carbon dioxide combining power can occur. Blood sugar values must also be checked frequently since severe insulin sensitivity can follow subtotal adrenalectomy.

Twelve patients with adrenocortical hyperplasia were treated during the period from 1933 to 1950. Of these, 5 underwent operative investigation only. Of 5 who underwent bilateral hemiadrenalectomy, 3 are normal, 1 was benefited, and 1 died of adrenal failure. One patient treated by adrenal denervation recovered clinically initially, but died 2 years later of measles and acute adrenal failure. One patient treated with testosterone showed only slight improvement in his condition.

In a year and a half since cortisone came into use, 8 patients with Cushing's syndrome due to adrenocortical hyperplasia were treated with encouraging but as yet incomplete results.

At present it is not considered necessary to perform total adrenalectomy unless the disease is progressive following subtotal adrenalectomy.

ALLAN K. SWERSIE, M.D.

Hypernephroma in Children; Report of 2 Cases. RICHARD H. HEMPSTEAD, MALCOLM B. DOCKERTY, JAMES T. PRIESTLEY, and GEORGE B. LOGAN. *J. Urol.*, Balt., 1953, 70: 152.

Hypernephroma or adenocarcinoma of the renal cortex rarely occurs among children. About 95 per cent of the tumors of this type develop in persons over 40 years of age. In a review of 199 renal tumors, Melicow noted that the youngest patient with hypernephroma was 30 years of age.

In seeking an explanation for the infrequency of hypernephromas during childhood, the authors speculate that hypernephromas may originate from renal adenomas. The development of renal adenomas is slow and related to the aging process, producing arteriosclerotic destruction of the glomerular tufts. These adenomas have a low growth potential, and hypernephromas so engendered tend to remain silent

menaces until rather considerable size has been attained.

Since the literature is devoid of authentic case reports of hypernephroma, 2 cases observed at the Mayo Clinic are described.

An 8 year old boy was admitted with a 2 month abdominal enlargement treated ineffectually with 9 x-ray treatments to the left renal area. A large, firm, nontender smooth mass filled the left flank and abdomen. Roentgenograms revealed calyceal deformity consistent with an expanding intrarenal lesion. A large neoplasm weighing 1,050 gm. was removed through a left rectus incision. It was an encapsulated solid tumor 15 by 15 by 12 cm., expanding the lower kidney pole. On section the tumor was found to be a degenerating necrotic yellowish mass with gross characteristics of hypernephroma.

Microscopically the picture was essentially that of large polygonal clear cells disposed in alveolar formation. The appearance was definitely glandular. Eight months after operation the patient was in excellent general health.

A 14 year old boy complained of dull right upper quadrant pain of 8 months' duration. One episode of hematuria had occurred. There was a movable nontender mass the size of a grapefruit in the right upper quadrant. On x-ray examination there was no function on the right side. Calcifications overlay that area. Retrograde films showed deformity of the calyces consistent with neoplasm.

After removal, the right kidney was found to weigh 540 gm. Gross involvement of the renal veins by tumor was evident. The microscopic picture showed fibrous septa dividing the field into alveolar units composed of pale-staining polygonal cells. The diagnosis was adenocarcinoma of grade 2, hypernephroma type. Postoperative radium and x-ray treatments were given. The patient died a year later with metastases. ALLAN K SWERSIE, M.D.

Surgical and Hormonal Therapy of Benign and Malignant Androgenic Hyperfunction of the Adrenal Cortex. C. V. HODGES. *Tr. West. Sect. Am. Urol. Ass.*, 1953, 19: 50.

The purpose of this presentation is to contrast the efficacy of surgical and hormonal methods of controlling benign overactivity of the adrenal cortex in the adrenogenital syndrome and to present an attempt to suppress this syndrome in a patient with metastases from an adrenocortical carcinoma.

The adrenogenital syndrome in male children may be caused by either adrenocortical hyperplasia or adrenal tumors. These patients tend to exhibit episodes of acute adrenal insufficiency and may not survive long enough to allow genital changes to occur or the condition to be suspected. Rapid virilization occurs.

The most frequently encountered example of this syndrome in childhood is the female pseudohermaphrodite. Progressive virilization occurs with early appearance of pubic hair, acne, somatic overgrowth, and advanced bone and height age. These females are constitutionally rugged, are excellent surgical risks, and show little tendency toward addisonian crisis.

The total urinary excretion of 17-ketosteroids is markedly increased in this syndrome caused by either hyperplasia or tumor.

This study is based on 4 female patients exhibiting the adrenogenital syndrome. In 3, congenital adrenocortical hyperplasia was found and the fourth patient was found to have a carcinoma of the adrenal cortex. The 3 nonmalignant patients were subjected to partial extirpation of the adrenal glands or hormonal therapy with cortisone acetate, or a combination of these procedures was used in an attempt to suppress excessive secretion of the androgenic hormones. Two of the 3 derived little or no benefit from the surgical removal of approximately one-half of the total adrenal mass. Two of the 3 showed prompt decreases in 17-ketosteroid excretion toward normal levels after the institution of cortisone therapy.

This laboratory change was accompanied by a disappearance of the acne which was interpreted as early evidence of suppression of the hyperandrogenic state. Because there was some evidence of suppression of the androgenic hyperfunction by hormonal means, this was tried in 2 cases in which malignant cells originated in the same area and exhibited the same androgenic properties. Although the cortisone dosages were increased up to as high as 300 mgm. daily there was no clinical evidence of benefit nor was there any influence on the enormously increased excretion of 17-ketosteroids.

The contrasting effect of cortisone on the urinary 17-ketosteroid excretion in benign versus the malignant hyperfunction of the androgenic elements of the adrenal cortex may be of some value as a means of differentiation. ROBERT O. BEADLES, M.D.

Wilms's Tumor in an Adult; Report of a 10 Year Cure. GEORGE R. LIVERMORE. *J. Urol.*, Balt., 1953, 70: 141.

Wilms's tumor in the adult is rare and, as far as can be determined, the prognosis is even worse than in children. There are difficulties and inaccuracies in the classification of embryonal renal tumors, resulting in considerable discrepancy as to the total number of such cases. Culp and Hartman, in an extensive review, collected 97 cases from the literature and added 6 of their own. They suggest the name "embryonal nephroma" for the entire group, which may then be subdivided into tumors of cortical origin "mesoblastic nephromas," and those of pelvic origin, "mesonephric blastomas." The mesoblastic group is further subdivided into carcinoma, sarcoma, and mixed and undifferentiated types. It is believed the subgroups have a common pathogenesis and probably all arise as the mixed type, with subsequent preponderance of one or the other cell type.

The treatment of choice with most authors is preoperative radiation, which may make inoperable

lesions operable, followed by transperitoneal nephrectomy. Long survivals in 4 cases of Wilms's tumor in the adult have been reported, the patients surviving 6, 8, 11, and 15 years, respectively, up to the time of the report. The author presents his case, with a 10 year survival.

A 37 year old white woman, first seen in June, 1941, gave a history of having noticed a firm, round, nontender mass in the right loin since 1938. Because of increasing pain, fever, and tenderness in the mass, a local physician operated in January, 1941, finding a perirenal abscess and a tumor mass. A section of the tumor was excised for biopsy and showed Wilms's tumor.

She was referred to the author 5 months later, still draining mucopurulent material. There was a firm round mass the size of a medium grapefruit below the right costal margin. On roentgenography the right lower calyx was shortened and the entire pelvis was pushed upward. Extending from the lower pole of the right kidney was a mass which reached to a level 1 inch below the crest of the ilium.

Deep x-ray treatments to a total of 4,100 roentgens through an anterior and posterior portal caused a 25 per cent decrease in the size of the tumor mass. It was possible to perform nephrectomy through the usual loin approach. The pathological report was Wilms's embryonal tumor. A letter from the patient 11 years after biopsy and 10½ years after nephrectomy indicated that she was "still well and doing fine." ALLAN K. SWERSIE, M.D.

The Persistence of Fetal Structures in Pyelonephritic Kidneys. A. G. MARSHALL. *Brit. J. Surg.*, 1953, 41: 38.

Marshall's histologic investigations of the persistence of fetal structures in pyelonephritic kidneys suggested that focal or localized dysplasia of the renal parenchyma is the usual underlying lesion in pyelonephritis of children. Relative ischemia may be responsible for the infection of the dysplastic foci. It is suggested that there may be a relationship between the primary condition of dysplasia and the subsequent development of arterial hypertension.
ROBERT TURELL, M.D.

Renal Injuries. CARLISLE F. SCHROEDER and DAVID S. RANDALL. *Surg. Clin. N. America*, 1953, 33: 1171.

Expanding mechanization has brought about an increase in injuries to all organs. To some extent the kidneys are protected anatomically by their position in the retroperitoneal space, by their mobility, and by the flaccidity of the renal pelvis and vascular stalk. Because of greater physical activity, the incidence of injury is higher in men. The right kidney, possibly because of its lower position, is injured more frequently.

An etiological classification headed by direct trauma is presented. Various degrees of severity are encountered, varying from mild contusions with trivial symptoms to renal pulpefactions and vascular tears of the pedicle with grave consequences.

Kidney trauma is an emergency requiring early diagnosis first of all. An outline for diagnosis is presented, inclusive of history, physical and laboratory findings, and x-ray and cystoscopic studies. It is particularly necessary to know the status of the opposite kidney.

The greatest difference of opinion is encountered in the matter of treatment. The trend is toward conservative management. Surgery has definite indications, such as primary or secondary hemorrhage, increasing mass in the flank, urological evidence of severe renal damage, and overwhelming sepsis. The route of approach varies with the concomitant injuries. The flank incision is most often used, but in the presence of intraperitoneal lesions, the transperitoneal route may seem advisable, or the transdiaphragmatic, when there are associated chest injuries. The operative procedure should vary with the extent of damage, renal substance being conserved when possible. ALLAN K. SWERSIE, M.D.

Indications, Technique, and Results of Partial Nephrectomy in Cases of Renal Calculi (Indicazioni tecnica e risultati delle nefrectomia parziale nella calcolosi renale). LUIGI MIGLIARDI. *Urologia*, Treviso, 1953, 20: 131.

Twelve cases of partial nephrectomy form the material for this report. All of the resections were carried out on a renal pole (1 was an upper pole resection; all the rest were lower pole resections); the midportion of the kidney was not involved in any of these cases. In one lower pole resection an accident required immediate postoperative removal of the kidney; in all the rest a long period of postoperative observation of the resected kidney enabled an assessment of the ultimate results. The latter material comprised: 1 instance of calculosis of the upper pole of the kidney with amputation of this portion of the organ; 5 instances of uncomplicated (isolated) calculosis of the lower pole of the kidney with amputation of this portion of the organ: 4 instances of calculosis of the lower renal pole, the process involving also the renal pelvis, with amputation of the lower pole and a contemporaneous pyelolithotomy; and 1 instance of calculosis of the lower renal pole complicated by a stone in the homolateral ureter, with amputation of the lower renal pole and contemporaneous ureterolithotomy.

In the 6 cases (1 upper pole and 5 lower pole involvements) of stone limited to a single renal pole, the ultimate results were extremely satisfactory. After 20 to 30 days the urine would become limpid, with a trace of albumin or of pus. In only 1 instance did a pyuria persist for some months. The function and morphology were not affected by the operation; even if the patient presented a compromised kidney preoperatively, the condition always improved markedly after the operation. In these 6 patients there has been no indication of a return of the condition up to the present time. In 1 patient this period of observation has been 11 years,

in another, 8 years, in a third, 6 years, in a fourth, 4 years, and in the last two, 2 years. In 1 of these patients a large stone was discovered in the renal pelvis of the opposite side after 7 years; this was removed by pyelotomy. In another patient a stone was discharged from the left kidney 9 years after the removal of the lower pole of this kidney; before operation this kidney had evidenced a large number of calculi. None of these had ever been discharged before the operation. There was no evidence, 2 years later, of a recurrence of the calculous condition, and no evidence of abnormality (other than the absence of the inferior calyx) in the function or the morphology of the kidney under discussion.

In the 4 instances of calculosis of the lower pole of the kidney which also involved the renal pelvis, and in the 1 instance of calculosis of the lower pole of the kidney associated with stone in the ureter, the late results were not so constantly favorable as in the instance of isolated involvement of the lower pole itself. Nevertheless, the results seemed good enough to justify the procedure. Two patients, those subjected to partial nephrectomy and pyelolithotomy presented a limpid urine without trace of albumin or pus 3 and 2 years, respectively, after the operation, and a notable improvement in the function and morphology of the kidney was observed. In 1 of these patients a marked dilatation of all the renal cavities had been present preoperatively; this was not in the inferior calyx alone, so there was no question at the time of the correctness of the indication for partial nephrectomy of the lower pole; yet 3 years later this kidney appeared to be almost normal morphologically, with the exception of the absence of the inferior calyx.

In another of these 4 complicated conditions, treated by partial nephrectomy and pyelolithotomy, the patient presented a limpid urine, without trace of albumin or pus 2 years later, and exhibited a shadow lateral to the kidney pelvis. The author has not been able to determine whether it represents a recurrence of the calculous condition or a stone which had escaped into the perirenal tissues at the time of the original operation. Here preoperative roentgenologic facilities would have made available the true picture of events.

In the last of these 4 complicated cases the roentgenologic examination, 3 months after the operation, disclosed an evident improvement in the function and the morphology of the kidney which had been operated upon; however, a nut-sized stone was discovered in the corresponding renal pelvic cavity. This stone, the author believes, was the one which had escaped removal at the time of the original operation.

Finally, in the patient with calculosis of the lower pole of the kidney associated with stone in the ureter, the roentgenologic examination made some months after operation disclosed a stone which, the author believes, had escaped removal at operation; however, this stone has not since increased in size, and the general function and morphology of the operative kidney have improved notably.

Thus, the author thinks that the operation of partial nephrectomy is not only relatively benign and easy of performance but represents an appreciable addition to conservative surgery of the kidney. In the instances of multiple calculi in a renal pole, partial nephrectomy frequently represents the sole procedure which promises complete removal of the stones. Even in the complicated conditions of this nature the operation of partial nephrectomy —plus any further procedures found necessary— may be undertaken with reasonable assurance of success. JOHN W. BRENNAN, M.D.

Autogenous Vein Grafts and Venous Valves in Ureteral Surgery: an Experimental Study. MILTON L. ROSENBERG and GREGORY A. DAHLEN. *J. Urol.*, Balt., 1953, 70: 434.

The authors employed fresh autogenous vein grafts in ureteral surgery on dogs to repair ureteral defects with vein grafts and to employ the venous valvular system for the prevention of fecal or urinary reflux up the ureter in ureterosigmoidostomy or ureterocystoneostomy. Twelve dogs were used; 6 ureterovenosigmoidostomies, 4 ureterovenoureterostomies, and 2 ureterovenocystostomies were performed.

In the 6 dogs subjected to ureterovenosigmoidostomy the vein lumen became narrowed and was lined with transitional cell epithelium, the vein graft was markedly shortened, and the cellular elements of the autograft wall were replaced by a reactive ingrowth of fibroblasts from the tissues adjacent to the graft. The elastic fibers persisted but were distorted by fibroblastic invasion; although reflux of the feces was prevented, there was partial obstruction to the flow of urine in every case. In the 4 dogs subjected to ureterovenoureterostomy, heterotopic bone formed next to the ureteral epithelium, and complete occlusion of the graft occurred with fibroblastic replacement of the entire vein wall except for some of the elastic tissue. The distal end of the graft leaked and sloughed 48 hours after each of the 2 ureterovenocystostomy experiments and therefore the ultimate fate of the autograft could not be determined.

The authors conclude that the use of venous autografts in ureteroenterostomy or other ureteral surgery is not practical at present. Only by observation of the biological response of tissues to autologous or homologous grafts can an understanding develop of the specific processes involved in the production and prevention of fibrosis in grafts of this kind.

DAVID ROSENBLOOM, M.D.

Papillomas of the Upper Urinary Tract (Ueber die Papillomatose der oberen Harnwege). R. FRAUBOES. *Zschr. Urol.*, 1953, 46: 273.

Papillomas of the ureter or of the ureter and bladder are mostly the result of "seeding" from papillomas of the renal pelvis. They possess an epi-

thelial covering and may be of the infiltrating or noninfiltrating variety. Because of their tendency to multiply and degenerate it is wise to consider all papillomas clinically malignant until proven benign.

The author discusses 8 cases of papillomas seen within the last 3 years at the General Hospital in Hamburg. In 6 cases the primary lesions were in the renal pelvis and in 2 they were in the ureter. All were accompanied by involvement lower in the urinary tract.

On the basis of experience and after a review of the literature, the author presents the following generalizations:

1. Once a papilloma is found, a search should be made for similar lesions higher in the urinary tract.
2. Papillomas of the renal pelvis or ureter should be treated by nephroureterectomy and partial bladder resection even when no other papillomas are discovered and the histologic report indicates a benign lesion.
3. Every case of urinary tract papilloma must be followed up carefully even after a radical operation.
4. Vesical papillomas should preferably be treated by total cystectomy. WARREN R. LANG, M.D.

A New Ureteroplasty: Advancement of the Ureter by a Vesicoureteral Pedicled Graft. ROBERT B. HIGGINS. *J. Urol.*, Balt., 1953, 70: 376.

An intriguing and ingenious method for the reconstruction of severe ureteral defects which had resulted from traumatic ureteral destruction or after ureterostomy or other forms of reconstruction had failed is presented by the author.

The construction of the vesical horn was prompted by the desire to overcome a severely strictured ureteral area and to preserve the ureterovesical juncture in a young patient with a solitary kidney on whom innumerable operative procedures had been performed. Much information was obtained from an exhaustive review of the ureteral anatomy and physiology. It had already been established that if one point of the major vascular supply was intact, the anastomotic circulation of the ureter would distribute the blood in sufficient fashion. Main vessels arise from the renal vessels, the spermatic or ovarian, the common iliac or external iliac, or from the hypogastric vessels at their source. From below, the ureter is supplied by various branches of the hypogastric arborization and from the bladder vessels. It is the intricate and delicate free anastomosing of these vessels which permits extensive ureteral surgery. Destruction of the ureteral nerve supply is of little true significance because of the intrinsic nature of the ureteral musculature. Since the bladder was involved in the production of the horn, the vesical nerve enervation was seriously considered. It was found that unilateral interruption of the various nerve fibers only produced a temporary neurogenic bladder which soon returned to normal.

After the anatomical and physiological soundness of the proposed procedure was established, the following method of approach and reconstruction of the severely damaged ureter was carried out by the author.

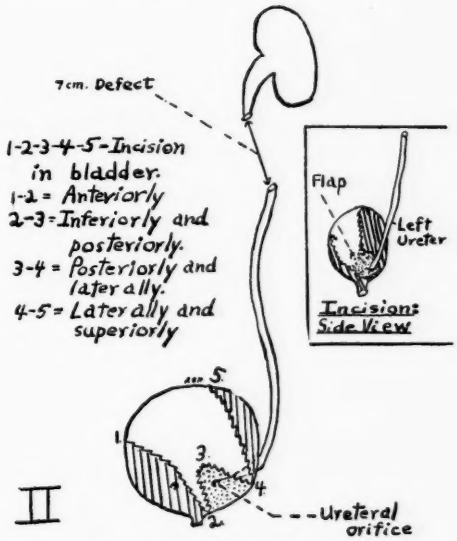

Fig. 1 (Higgins). Bladder incision.

Through a left thoracolumbar incision extending to the symphysis, excellent exposure of the kidney, ureter, and bladder was obtained. The adjacent scar and incarcerated bowel were dissected free of the ureter and the diseased ureter was excised to leave a 7 cm. gap between the renal pelvis and the upper end of the ureter. The distal ureter and the entire left side of the bladder were mobilized, during which surgery as much of the arterial blood supply as possible was preserved.

A long, curved, wedge-shaped, pedicled graft was produced from the bladder (Fig. 1). The graft base extended to the right posterior aspect of the bladder and the apex of the wedge from the posterior aspect of the bladder included the left ureterovesical orifice. An extension of the incision produced two converging incisions across the dome of the bladder which ended lateral to the left side of the urethra. The trigone was then divided and the left ureteral orifice was freed from the bladder. The unfolding of this bladder flap permitted an extension of the ureterovesical orifice for 15 cm. and, thus, a 15 cm. advancement of the ureter toward the renal pelvis. The bladder flap was converted into a tube with a continuous fine catgut suture. No splints were used. The ureter and renal pelvis were anastomosed with fine running catgut.

The postoperative follow-up indicated an excellent result with an intact patent anastomosis. Fifty-one days postoperatively the nephrostomy catheter was removed and the sinus was promptly closed. Renal clearance studies indicate excellent renal function;

however, the patient's urine remains infected. The anastomotic sites accepted the passage of 8 to 10 F. catheters 14 months following surgery. Adequate drainage was indicated through pyelographic studies, and 1 month after removal of the catheter a bladder capacity of 325 c.c. was found with a residual of 30 c.c. Ureteral reflux did not develop.

PETER L. SCARDINO, M.D.

Leakage and Reflux in Ureterointestinal Anastomosis: The Free Peritoneal Graft. FRANK HINMAN, JR. *J. Urol.*, Balt., 1953, 70: 419.

Hinman states that occasional instances of leakage following direct ureterointestinal anastomosis led him to try the free peritoneal graft as a reinforcement for the anastomosis.

Forty-two anastomoses were done on 11 dogs, alternately with thrombin-plasma cement and interrupted cotton sutures. The results of transplantation with a full-thickness graft (peritoneum with posterior rectus sheath) were slightly superior without any reinforcement.

Hinman concludes that the use of the free peritoneal graft will be limited to the anastomosis with an insecure suture line which cannot be reinforced by an additional row of sutures or the formation of a tunnel. Furthermore, assurance against leakage is not enough; there is need for the prevention of reflux. DAVID ROSENBLOOM, M.D.

BLADDER, URETHRA, AND PENIS

Bladder Hernia. Survey and Case Report. STIG KOLLBERG. *Acta chir. scand.*, 1953, 105: 407.

Hernia of the bladder has been known to surgery for a very long time and references to it are made in the twelfth and thirteenth centuries. The first scientific report was issued by Verdier in 1753.

When the bladder is empty it lies in the pelvis. When it is distended, it then comes into contact with the hernial orifices and may appear in the inguinal, femoral, or obturator foramen. Uncommon variations appear as suprapubic hernia, direct protrusion through the rectus abdominis muscle and, thirdly, ischiorectal hernias. Hernias are divided into the extraperitoneal, paraperitoneal, and intraperitoneal types. The extraperitoneal and paraperitoneal types may be primary and the paraperitoneal and intraperitoneal types may be secondary. The extraperitoneal hernia is the rarest form of the three; as a rule a direct inguinal hernia ensues. The paraperitoneal form is the most common; it may be inguinal or femoral. Intraperitoneal bladder hernias are rare and are always secondary in origin; the upper and posterior part of the bladder is involved. According to Eisendrath and Rolnick, the inguinal type embraces 70 per cent of cases. The femoral type accounts for 27 per cent, while the remaining 3 per cent represent the rarer forms. Of all hernias, from 1 to 3 per cent involve the bladder.

Bladder hernias are rare in children, since the bladder is an abdominal organ. The majority of bladder hernias are in the age groups over 50 years and the ratio of males to females is 3 to 1. This hernia usually occurs in persons with chronic distended bladders. Repeated pregnancies with increased intra-abdominal pressure may be looked upon as a predisposing cause. Pericystitis is also supposed to play a part in the pathogenesis.

The diagnosis is seldom made before operation, and frequently not until after operation, when leakage from a bladder injury occurs. The majority of hernias are unaccompanied by symptoms, but usually urinary difficulty is present.

Surgical reduction of the hernia is usually difficult, and since the patients are aged and have prostatic hyperplasia or urethral stricture the symptoms are attributed to these findings.

Cystoscopy and cystograms will usually confirm the clinical diagnosis.

The author reports a case of large scrotal bladder hernia. NATHAN ROSENBLOOM, M.D.

Vesical Neck Obstruction in Children. MOGENS ANDREASSEN. *Acta chir. scand.*, 1953, 105: 398.

Vesical neck obstruction is a relatively rare affection among congenital anomalies of the urinary tract, but nevertheless deserves careful consideration within the field of urology of children.

The presence of congenital valves in the prostatic urethra is the most frequent cause of obstruction in boys. Generally, they are vertical or diaphragm-like folds of the mucosa in the region of the verumontanum. Hypertrophy of the sphincter vesical is not of neurologic origin; it is considered analogous to achalasia at the cardia and pylorus. In rare cases, the obstruction is caused by a stricture in the posterior urethra. Intravesical lesions such as ureterocele and folds of the bladder mucosa have been described as causing vesical neck obstruction. In certain cases, no demonstrable cause can be found, and it is uncertain whether or not the condition in these cases is due to changes in the autonomic nervous system.

This type of obstruction is more frequent in boys. Usually the symptoms do not appear until the child is 2 to 3 years old. Residual urine, diverticula, and upper tract dilatation occur gradually. Symptoms are usually due to urinary infection, which accompanies the stasis.

Three methods of examination are especially valuable in the diagnosis of the disease: estimation of the residual urine, cystometry, and cystography. In small children, urethral catheterization may cause complete retention. Cystometry is also difficult to evaluate in small children because of the use of abdominal pressure. Cystography reveals the size of the bladder, ureteral reflux, and conditions in the posterior urethra above the obstruction.

Treatment is aimed at removing the obstruction. Dilatation of the urethra may be tried. Transurethral resection of the hypertrophied sphincter has been used, and anterior suprapubic cystourethrotomy with sphincterotomy is recommended.

The author has used this last approach in 4 of the 6 cases he reports, with good results in 3. In all of the 6 cases, a sphincter anomaly existed; 5 patients were treated surgically; in 4 cases smooth muscle tissue with fibrosis was present. Of the 5 surgically treated patients, only one was worse after treatment. Early treatment, before dilatation has developed, is recommended since one patient showed no improvement even with an indwelling catheter.

NATHAN ROSENBLOOM, M.D.

The Recognition and Treatment of Congenital Urethral Valves. F. P. RAPER. *Brit. J. Urol.*, 1953, 25: 136.

Congenital urethral valves occur only in boys and they are most often presented either as a urinary tract infection or some form of urinary incontinence. Twenty-nine patients ranging from 3 weeks to 17 years of age were seen and the following symptoms were observed:

1. Urinary tract infection. This is most unusual in the young male unless he has some anatomical defect. The finding of infected urine in a boy should lead to further investigation.

2. Urinary incontinence. As the valves are obstructive one would expect difficulty in voiding to be a symptom. The child is usually not cognizant of the fact that his urination is abnormal. In 6 of the cases observed the parent had noticed difficulty and a poor stream. Most often the disturbance is in the form of an incontinence which is not recognized to be abnormal until the age of 3 or 4 years. Clinical examination in general of the majority of these patients was normal, except when severe renal disease was present. In every one, however, a distended bladder was palpable.

Observation of the child during the act of micturition is most valuable when there is the complaint of enuresis, for it permits segregation of patients with a neurogenic bladder or obstruction from those with a functional enuresis, the latter being able to pass urine without difficulty.

Sixteen of the children had urine which was infected at the time of admission to the hospital. Anemia was present when there was severe renal damage. The most valuable roentgenogram was the cystogram, and if possible a cystourethrogram was taken during micturition. If the latter could not be taken, it was found valuable to fill the bladder with dye while the child was under an anesthetic and take the roentgenogram while pressure was exerted on the distended bladder.

The most satisfactory instrument for examination was the McCarthy infant-size panendoscope, and a useful hint to help in visualization of the posterior urethra was to exert firm pressure on the distended bladder so that the posterior urethra was opened.

The usual evidence of obstruction are findings such as trabeculations, wide ureteral orifices, and small diverticula. When valves are present, the prostatic urethra is much wider than normal and fine ridges or trabeculations may be seen in its walls. The veru is usually normal. In 28 of these patients the valves were below the location of the verumontanum.

In the treatment of this condition the author advocates preliminary drainage through the use of a suprapubic cystotomy. Drainage being established, accurate correction of the chemical and fluid imbalance and suitable antibiotic therapy should be carried out. The definitive treatment is removal of the valves and is most simply done with a diathermy electrode through the infant panendoscope. Two other methods were utilized, the retropubic approach and the approach through a perineal urethrostomy, in which the valves were excised with fine forceps and scissors.

Of this group of 29 patients, 6 have died, 7 have suprapubic cystotomies at the present time, and 16 pass urine through the urethra. In the last group micturition is normal in 12, 4 do not as yet have perfect control, and 2 continue to have slight difficulty. It was found that it took some weeks after the operation to develop the normal reflexes in micturition. All of the patients with suprapubic cystotomies have very severe renal damage and are considered unfit for further operative surgical therapy.

ROBERT O. BEADLES, M.D.

Reconstruction of the Male Urethra Because of Strictures (Die Rekonstruktion der maennlichen Urethra bei Strikturen). BENGT JOHANSON. *Zschr. Urol.*, 1953, 46: 361.

The great number of methods for the repair of strictures indicates that none of the procedures meets all needs. The first successful reconstruction of an epispadic urethra was done by Thiersch in 1870. Anger used the method for the repair of hypospadias. The drawback of the procedure is the fact that too much tissue is needed and that the skin strip for internal covering must be 3 cm. wide. Buchnall, in 1907, used a method which is the basis for some recently published modifications, but it cannot be applied in cases of extensive hypospadias. In 1911 Ombrédanne introduced the new principle of constructing a urethra from the combination of a penoscrotal and preputial flap. Nové-Josserand recommended utilization of a transplanted skin tube which gained practical value through the modification of McIndoe in 1937. Nevertheless, stricture resulted even if the guiding rod remained in place for 9 months and more. Simon Duplay described a principle, in 1880, whereby an epithelial strip of scrotal skin was buried for the treatment of hypospadias. G. Marion and J. Pérard utilized this method for a one-stage repair in 1947. Denis Browne published, in 1946, his modification of the Marion-Pérard operation. Some of the important points are as follows:

1. Diversion of the urinary stream by perineal urethrostomy is necessary.

2. The buried skin flap must not be detached from its base and should measure 1 cm. in width in children 4 years of age, and 2 cm. in adults.

3. In order to achieve broad approximation of the skin flaps, retention sutures are necessary; they

should consist of small glass pearls in conjunction with aluminum cylinders.

4. A decompressing dorsal skin incision is necessary for the prevention of tension at the suture line. In analogy to the skin tunnel experiments which Nesbit and his associates performed on guinea pigs, the author reconstructed the resected dog urethra by means of a buried skin strip. The epithelium became stable after 3 weeks. The animals were observed for 1 year. The author had an opportunity to study the results of three operators, McIndoe, Kilner (who used Ombrédanne's technique), and Denis Browne, during 1949 and 1950. Among the three methods, that of Denis Browne seemed to be the only acceptable one. It fulfilled the postulate to reconstruct the hypospadic urethra in one stage, assured a normal urethral caliber commensurate with the age of the patient, no stricture formation occurred, and normal growth and elasticity adequate for erection resulted. The author examined 48 of the 51 patients with hypospadias who were operated upon by Denis Browne in the period from 1946 to 1949. Micturition and erection were checked and the caliber was Fr. No. 14 for children under 4 years, Fr. No. 16 to 18 for children of 6 to 8 years, and Fr. No. 18 for children more than 8 years of age. Sounding was done easily without anesthesia. Only in 2 cases was a fistula closure necessary. All others were completely healed at the time of follow-up.

The author performed 100 operations for hypospadias in Sweden since 1950. In order to treat strictures he used the principle of Denis Browne's operation. During the first stage the stricture was incised in its entire length and the mucosal edges were sutured to the skin. After 6 weeks the artificial hypospadias was treated by burying the mucosal skin strip, over which the adjacent, widely mobilized skin margins were broadly approximated by retention sutures after a dorsal decompressing skin incision had been performed. After the first stage an indwelling urethral catheter was left in the newly created proximal hypospadic meatus and after the second stage a perineal urethrostomy was performed if the bulb was intact.

In cases with strictures of the proximal part of the bulbous urethra an invaginated skin flap from the scrotum with an incision on its tip was used instead of the adjacent skin as described for strictures of the anterior urethra. To facilitate coaptation the bulbous portion was exposed perineally, the bulb and adjacent stricture were incised longitudinally, and special stay sutures were attached to the mucosal edges which helped to suture them to the inverted skin flap. The perineal incision was closed. Six weeks later the inverted flap was severed from its surroundings and buried according to the Denis Browne method. If the stricture was not longer than 5 cm. an indwelling catheter could be used; in all other cases a suprapubic trocar cystostomy served to divert the urinary stream. The author has operated on 33 patients with stricture since 1950 and with the exception of the first 2 none had to be reoperated upon. He believes that urinary fistulas of any etiology may also be closed with this procedure.

ERNEST BORS, M.D.

GENITAL ORGANS

The Value of the Elimination of 17-Ketosteroids in the Urine of the Prostatic Patient (I valori di eliminazione dei 17-chetosteroidi urinari nei prostatici). PIERO DE FAVENTO. *Urologia*, Treviso, 1953, 20: 176.

During the past 3 years 180 patients were received in the author's service, showing disturbances of a prostatic character. Seventy of these were operated upon and the histologic diagnosis of their condition was established. These 70 cases are here reported in tabular form. Not included in this table, however, are the 16 patients, studied by the same methods and subjected to the same criteria as the cases reported in the present table. The first portion of this table must therefore be consulted in the first publication (*Urologia*, 1951, 18: 539). In both tables the clinical diagnosis (based on the digital rectal examination), is followed by the daily urinary 17-ketosteroid determination, and this is followed by the histological diagnosis.

A study of this tabular summation suggests the following points for discussion: in the instances of prostatic hypertrophy the index of elimination of the 17-ketosteroids was never less than 3 mgm. An index of less than 3 was seen only in instances of prostatic carcinoma. In only 4 of the 70 prostatectomized patients did the index prove fallacious, that is, in only 4 instances did an index of more than 3 prove to be a case of prostatic carcinoma on histologic examination. Thus, the test proved correct in 64 instances (91.5 per cent); in 2 patients the test was doubtful (2.8%), and in 4 (5.7%) it was erroneous.

In the clinical diagnosis, on the other hand, the results proved correct in 47 instances (67%), doubtful in 12 (17%), and erroneous in 11 (16%). In 7 of the 12 doubtful instances, the clinical suspicion was verified and in 5 it was not verified. Thus, in these 12 doubtful cases the error was 23 per cent. The percentage of error in the clinical diagnosis would, of course, have been much higher if, with gained experience, it had not been deemed better to subject many patients exclusively to medical therapy when the diagnosis of neoplasm was based solely on the index of elimination of the 17-ketosteroids and the digital examination had given a negative or doubtful result.

In a further 75 cases of this total material of 180 prostatic patients, in whom prostatectomy was not done, it may be positively affirmed that the diagnostic error incident to the index of elimination of the androgenic substances was not greater than that of the group with histologic control.

In conclusion, the author asserts that the values for the elimination of the 17-ketosteroids constitute a test which should be systematically carried out in the differential and early diagnosis of prostatic

neoplasm, and that the diagnostic results are superior to those based upon rectal exploration and the other methods used in the past.

In the total number of cases tested, in which the index of elimination of the 17-ketosteroids was below 3 mgm., the condition was always carcinoma. In a few instances (approximating 5 per cent) the index of elimination was not lowered, although heteroplasia was present. This percentage of error is certainly not excessive for a biologic test.

JOHN W. BRENNAN, M.D.

The Histopathology of Prostatic Carcinoma Due to Hormonal Treatment (Zur Histopathologie der Hormonbehandlung beim Prostatakrebs). H. RUPPERT. *Zschr. Urol.*, 1953, 46: 443.

While many articles regarding hormonal therapy of prostatic cancer have appeared during the past 12 years, only a few deal with the anatomical changes which accompany the clinical improvement. The author performed perineal needle biopsy, either by means of Wildegans instrument (10 cm. long and 3 mm. wide) for aspiration or with Melick's fenestrated punch instrument.

A 68 year old patient had a prostatic tumor the size of a small fist with large inguinal lymph nodes and a nonfunctioning left kidney as shown by intravenous urography. The sedimentation rate was 120/134, the acid phosphatase 1.06 Bodansky units, and the alkaline phosphatase was 4.05. Histological examination of the biopsy specimen disclosed: wide nests of ill-defined polymorphic tumor cells with nuclei of variable forms and rich in chromatin. Regressive changes of very mild degree were seen in the cytoplasm and there was very little stroma reaction. The smooth muscle fibers seemed to resist the expansile growth more than the collagenous connective fibers. Chronic irritation was visible in the form of histiocytelike cells which were arranged in a peculiar eddylike fashion. The same findings were present in specimens taken from the urethra and inguinal lymph nodes, respectively.

After the administration of Cyren B forte by injection, 2.5 mgm. every other day, for 4 weeks (a total of 44 mgm.), a second perineal biopsy disclosed dispersion of the tumor, increase of the stroma, regressive changes in the tumor cells in the form of pyknotic nuclei without mitoses. The clinical picture was that of general improvement, increase in weight, and absence of pain. Two months after admission a bilateral orchiectomy and a radical dissection of the inguinal nodes were performed.

Up to the time of the third perineal biopsy a total of 110 mgm. of Cyren B forte had been administered (2.5 months after admission). The phosphatase dropped to 0.84 (acid) and 2.01 (alkaline), and the sedimentation rate dropped to 35/64. No prostatic tumor could be palpated, only a cartilagelike induration.

The third biopsy disclosed regression of the tumor cells, which made them appear like primary mesenchymal tissue. The nuclei were evenly rounded or oval, and rarely pyknotic. The surrounding fibrotic tissue was rich in elastic fibers. A formation of ducts appeared, which were lined with squamous cells suggesting vaginal epithelium. No cancerous tissue could be found in the lymph node. The clinical condition continued to improve. From 500 to 2,000 mouse units of follicular hormone could be recovered from the urine. On palpation the prostate was small and firm. The phosphatase dropped to .54 (acid) and .96 (alkaline), and the sedimentation rate dropped to 25/48.

The fourth biopsy showed predominant expansion of the connective tissue with rare scirrhuslike dispersed tumor cells, further increase in elastic fibers, and proliferating cuboid or squamous epithelium of the ducts.

The author arrives at the conclusion that the destruction of the tumor cells is not achieved by mechanical compression of the increasing surrounding connective tissue, but is caused by the action of the hormone on the tumor cell proper. The reactive proliferation of the stroma is considered to be secondary and nonspecific. The clinical success of hormonal therapy is thought to be based upon a synergism which consists of the reduction of tumor vitality in association with reactive aggression of the surrounding connective tissue. The glandular or ductular proliferation is interpreted as a direct hormonal effect.

ERNEST BORS, M.D.

The Combined Treatment—Orchiectomy and Estrogen—of Prostatic Cancer (Ergebnisse der kombinierten Behandlung—Orchiektomie und Oestrogene—beim Prostatakrebs). ERICH HOLDER. *Langenbecks Arch. u. Deut. Zschr. Chir.*, 1953, 275: 178.

The author reviews the result of combined therapy of prostatic carcinoma with orchiectomy and estrogens over a period of 6 years. At the Surgical Department of the University of Heidelberg, 139 patients with prostatic cancer were treated in the period from 1943 to 1951, but during the first 3 or 4 years only palliative methods such as suprapubic cystostomy or transurethral resection were practiced. Since 1947 the combined treatment was used, in the beginning with stilbene, but since 1950 with progynon M. exclusively. This drug contains 0.2 mgm. of ethinel-estradiol per tablet. Following castration one tablet was given three times a day for 1 week, then twice a day during the second week, and once a day during the third week; thereafter this dosage was either maintained or further reduced to one tablet every other day, but the treatment was never completely interrupted.

The patient remained under constant follow-up supervision. The general condition, residual urine, pain, weight, rectal palpation, and especially the condition of the breasts are a better guide than the acid phosphatase. Gynecomastia with a slight sensation of tension in the breasts is a good indicator for the adequate dosage of hormones.

Among the 139 patients (1) 56 were treated palliatively and survived for only 1 year, (2) 16 were given

only hormonal treatment and survived 3 years maximally, and (3) 67 were subjected to the combined treatment. Thirty-six of the 67 patients had osseous metastases (53.7%). Twenty-eight of the 67 patients died, among them 19 with metastases, and 39 patients are alive, although 17 have metastases. Sixteen patients are working despite the fact that 9 of them have extensive bony metastases. Nine transurethral resections were done in the group of 67 patients. The author believes that with patience this figure could be reduced. It takes an average of 5 weeks of treatment until the residual urine decreases. Exceptionally, even a residual of 200 to 300 c.c. may disappear 2 weeks after the combined treatment. This depends not on the size of the tumor but rather on its relationship to the vesical neck. About 10 per cent of the patients failed to respond to the combined method of treatment.

As an illustration the author mentions the case of a 66 year old patient who received androgen treatment from his family doctor for prostatic hypertrophy, developed a cancer, and responded temporarily to the combined treatment, but succumbed within a year's time to rapidly spreading metastases. On the 4 patients who are alive 5 and 6 years, respectively, castration was performed 1 or 2 years after the start of hormonal treatment. The youngest patient was 49 years and the oldest 88 years of age. The majority of the patients were in the seventh decade. The author cannot match the statistical figures of Nesbit and Baum (of 1,800 patients 44 per cent were alive after 5 years without metastases and 21 per cent had metastases).

The effect of castration on bone metastases was equivocal; in the majority of cases they remained unchanged, while in the minority they disappeared on x-ray control. The author reports on 2 cases in which the roentgenologic evidence of metastases did not change despite the clinical unequivocal improvement with loss of pain, the ability to return to work in 1 patient, and a survival period of 6 years in both patients, aged 72 and 74, respectively. He also reports on 2 patients, aged 64 and 61, respectively, in whom a disappearance of skeletal metastases could be demonstrated roentgenologically.

He finds that only 5 to 10 per cent of prostatic cancers are amenable to radical surgery, that the operative mortality is between 3.1 to 6.3 per cent, and that the 5 year cure rate of 51 to 55 per cent is obtained at the expense of 43 per cent of complications, such as incontinence, strictures, and vesicorectal and perineal fistulas.

The author believes that the question as to whether hormonal treatment followed by radical surgery will yield better results has not been answered. He prefers the combined castration-hormonal treatment to radical surgery—if the operative risk and, above all, a life worth living in view of resulting complications, is taken into consideration. Castration should be reserved as a last step, except in the cases in which it is indicated immediately because of painful metastases. ERNEST BORS, M.D.

A Modification of Voelcker's Ischiorectal Prostatectomy (Eine Modifikation der ischiorektalen Prostatektomie nach Voelcker). GERHARD WILHELM HEISE. *Zschr. Urol.*, 1953, 46: 426.

There seem to be two trends in prostatic surgery—standardization versus individualization of procedure. Success does not depend on the operative procedure but rather on its proper indication. At the clinic where the author works two procedures are used: Millin's retropubic method in "younger" and lean patients, and Voelcker's operation. Fifty-five patients were treated by Millin's retropubic, and 55 by Voelcker's ischiorectal approach. Despite the use of antibiotics there was fever and pulmonary congestion following the Millin procedure, but none after Voelcker's operation. The oldest patient operated upon by Voelcker's ischiorectal route was 86 years old and had a completely normal postoperative P.T.R. curve. Occasional peristaltic difficulties are observed following the Millin technique; they are absent with Voelcker's operation. Shock, too, is practically absent with Voelcker's procedure, but occasionally there is considerable shock with Millin's operation although the same type of anesthesia is used in both instances. Since the approach is predetermined by anatomical structures, advances in prostatic surgery consist of modifications rather than the invention of new routes.

The author presents his modification of Voelcker's ischiorectal operation as follows: the fibers of the exposed levator ani are sharply severed and the fascia pelvis visceralis is exposed. In its lateral aspect the veins of the vesicoprostatic plexus become visible and the fascia is incised ½ cm. medially to this structure. By blunt finger dissection the rectum is then separated from the prostate and the prostatic capsule is exposed. Between stay sutures, which act also hemostatically on capsular veins, the capsule is incised longitudinally in contradistinction to the original method. The vesical neck can thus be exposed even if large adenomas are present because the incision can be extended. After incision of the capsule and digital enucleation of the adenoma, it is bluntly severed from the urethra, but sharply dissected from the rest of the surroundings, care being taken not to injure the urethral sphincter. The adenoma is then seized with tenacula and removed. The internal vesical sphincter is secured temporarily with stay sutures in order to perform hemostasis, and the prostatic bed is temporarily packed with hot saline compresses. After removal of the stay sutures and, without the originally described hemostatic suture ligatures of the vesical neck, the prostatic capsule is closed in two layers. Thereafter, 200,000 units of penicillin are instilled into the wound. No drainage was used in the last 30 patients, of whom all but 2 healed primarily. No urinary fistula was observed. Of 70 patients operated upon in this manner 2 died (1, a cardiac death in 3 weeks and 1 from purulent thrombophlebitis 4 weeks after operation).

The following points are considered by the author as the high lights of the improved technique: (1)

longitudinal incision of the capsule, (2) elimination of rectal injury, (3) exact hemostasis, (4) suture of the prostatic capsule, which compresses the vesical neck and aids in its hemostasis, (5) closed urinary pathways, and (6) the absence of postoperative impotency. ERNEST BORS, M.D.

MISCELLANEOUS

The Importance of Antibiotics in the Treatment of Urinary Infections. ERIK HALKIER, EIVIN HASNER, and BØRGE SORENSEN. *Acta chir. scand.*, 1953, 104: 468.

The authors present a series of 90 patients with urinary tract infection treated with the most modern antibiotic and chemotherapeutic agents and find that 66 per cent of those who were cured, were cured after one treatment with just one antibiotic. Bacteriological cure was obtained in 42 per cent of the entire group.

In order to improve the results the authors recommend: (1) no antibiotic treatment without previous sensitivity test, (2) instigation of treatment at the optimal time, and (3) avoidance of the catheter if possible. JOSEPH E. MAURER, M.D.

The Problem of Re-Education of the Paralyzed Bladder by Periodic Irrigation and Ionization (Problème actuel de la rééducation des vessies paralysées: l'irrigation périodique et l'ionisation). F. TRUC, R. SCHILLIRO, and D. EL MASRI. *J. urol. méd.*, Par., 1953, 59: 129.

The problem of the re-education of patients paralyzed by trauma or medullary pathology has received considerable attention in France. The authors have been interested for the past 3 years in providing the therapeutic means of restoring adequate vesical function to the "paraplegic."

It is necessary to make a physiopathological study of the bladder of each individual patient not only to establish the correct diagnosis but also to apply the proper therapy in order to obtain the best results for the patient.

The cystometric studies of the bladder will determine the tonus of the detrusor muscle and the presence or absence of reflex contractions of the bladder muscle. By this means, the capacity of the bladder, the maximum voluntary pressure, and the sensation of vesical distention can be established.

From the period of the initial spinal shock, through the various recovery phases, to the time when the bladder shows re-establishment of vesical contraction and tonus, the cystometric curves demonstrate these changes. The repeated manometric graphs change from one phase of vesical paralysis to another, and in this way the exact status of the bladder can be determined.

The cystoscopic examination does not give a great deal of information in the initial phases of vesical dysfunction. During the atonic phase the bladder shows fine trabeculation. In the second phase of recuperation, the bladder appears normal with increased, irregular trabeculation. In the third recovery phase, the cystoscopic examination shows a distended bladder with a solid, irregular contour and increased trabeculation when there is a complete section of the cord. When the injury to the cord is partial, the cystogram appears normal.

Cystourethroscopic studies of the vesical neck usually show a normal-appearing internal sphincter with some dilatation of the posterior urethra. The appearance of the vesicle neck and posterior urethra depends on the level of the spinal lesion.

The urethrocystographic studies are usually difficult to classify as they so often depend upon the level of the injury as well as the individual variation from patient to patient.

The re-education of the paralyzed bladder differs to such an extent that the therapy and the best method of managing the patient must be individualized.

The noncatheterization method of establishment of the automatic bladder, as well as repeated catheterization to empty the bladder, has not proved to be a satisfactory method of handling these cases. If the catheters are of small caliber and of soft rubber, preferably the "balloon bag type of Foley," the urethral retention catheter provides the best means of bladder drainage. Care must be taken to change the catheters frequently; thus, the usual sequelae of the indwelling catheters such as scrotal fistulas and periurethral abscesses may be avoided.

The authors describe the tidal drainage apparatus that has been suggested by Munro and used so effectively by Prather and others in this country for the treatment of the patient with a vesical paralysis. By using this means of bladder lavage, the bladder is stimulated to assume its physiological mechanism of normal filling and emptying.

Resection of the vesicle neck is also employed to facilitate complete bladder evacuation. In the patients who do not empty their bladder completely or in those whose detrusor mechanism does not function adequately as demonstrated by cystometric studies, transurethral revision of the vesicle neck may help to restore adequate bladder evacuation and, thus, satisfactory vesical function.

The authors used ionization effectively in 5 patients with vesical paralysis. In each case the residual urine was reduced and more normal micturition was established.

Several drugs have been used for ionization of the bladder. Prostigmine, dihydroergotamine, and acetyl-beta-methylcholine were used to combat the atonia of the vesical musculature.

The method described by the authors for vesical ionization was as follows:

The source of the current used was the continuous galvanic current, the same as the one employed in the electrotherapy of the Lamarque Electroradiologic Service in the St. Charles Clinic. The intensity of the current was between 2 and 10 ma., with the duration of the treatment usually 20 minutes. The interruption, resumption, or prolonga-

tion of the period of ionization is a matter of judgment based upon the patient's reaction to treatment. The electrodes were applied in the median hypogastric line with one electrode placed in the hypogastrium and the other in the bladder or in the sacral region. The medication to be used was placed in relation to the positive electrode. The drugs can be given by mouth or may be injected parenterally, but the bladder was usually filled with from 250 to 300 c.c. of a 20 per cent acetyl-beta-methycholine solution.

The anode was placed intravesically; one electrode was placed in the hypogastric region and the other in the sacral region. When the ionization is started, there may be some tingling felt by the patient, but if actual pain results, there is faulty technique.

There were no severe accidents or complications such as burns of the skin from this procedure. There has been no generalized reaction such as nausea, vomiting, bradycardia, or syncope, and no malaise whatsoever. The only reaction noted was sweating in patients having high medullary fractures.

The authors have included the case histories of 5 patients who have been greatly benefited by the use of tidal drainage and vesical ionization to increase the bladder tonus, provide adequate bladder evacuation, and reduce the residual urine.

CONRAD A. KUEHN, M.D.

Queyrat's Erythroplasia with Carcinomatous Invasion: Report of an Unusual Case. SEYMOUR FRIEDMAN. *J. Urol.*, Balt., 1953, 69: 813.

Erythroplasia of Queyrat is an uncommon precancerous lesion, and because of its rarity is not easily recognized. The single, well defined area with brilliant red velvety surface and little or no infiltration, occurs principally on the glans penis, vulva, mucous membranes of the mouth, and occasionally on the mucosal surface of the prepuce, but it is not always found as described and may even be misdiagnosed because it may not even remotely resemble this classical description.

The author has been impressed by the seriousness of this disease on the basis of his experience with a penile lesion in a 39 year old male in whom a small area on the left dorsal surface of the mucosal aspect of the prepuce had been present for 10 years and had resisted all forms of local therapy. It was removed by circumcision and histologically revealed a carcinoma in situ. In view of the potential seriousness of the lesion, adequate surgical therapy is urged.

PETER L. SCARDINO, M.D.

SURGERY OF THE BONES, JOINTS, MUSCLES, TENDONS

CONDITIONS OF THE BONES, JOINTS, MUSCLES, TENDONS, ETC.

Early Diagnosis of Primary Malignant Bone Tumors. G. EDMUND HAGGART and JOSEPH COPEL. *J. Am. M. Ass.*, 1953, 152: 883.

Primary malignant growths of bone are comparatively rare, but it has been stated by Phemister that of all sarcomas, bone sarcoma occurs most frequently. The highest incidence is found in the 15 to 20-year-old group.

In the presence of these tumors, as in any malignant process, the sooner a definitive diagnosis is made, the better the results obtained. Careful evaluation of the history, physical examination, laboratory studies, roentgenograms, and biopsy through the combined efforts of the surgeon, roentgenologist, and pathologist is necessary.

Intermittent to continuous bone, joint, or muscle pain, particularly if it is present when the patient is at rest, is stated to be the most significant symptom. Trauma as a pathogenic factor remains uncertain. Significant findings on physical examinations, in roentgenograms, and in laboratory studies are discussed. Methods of obtaining biopsies, and the role of the pathologist in the diagnosis, treatment and prognosis of primary malignant bone tumors are described in detail.

Primary malignant bone tumors are classified under the headings of osteogenic sarcoma, Ewing's tumor, multiple myeloma, giant cell tumor, and reticulum cell sarcoma. LOVICK E. DICKEY, JR., M.D.

Cavernous Hemangioma of Striated Muscle. KENNETH G. JONES. *J. Bone Surg.*, 1953, 35: 717.

A review of the literature on hemangiomas of striated muscle, with a report of 4 new cases (a total of 377 cases) is presented. The tumors described by the author were located in the flexor digitorum profundus, the lateral head of the gastrocnemius, the quadriceps, and in an interosseus muscle of the foot.

Hemangiomas are said to constitute 7 per cent of all benign tumors in man. In a review of 1,308 hemangiomas observed at Memorial Hospital, in New York, Watson and McCarthy noted the neoplasm to have been located within muscle in 10 instances. Another study, by Jenkins and Delaney, of 256 cases of muscle angiomas showed that in 94 per cent the lesions were present before the patient was 30 years of age. In 70 per cent of their cases the lesions were located within the muscles of the extremities.

Although there is no unanimity of opinion concerning the etiology of hemangiomas, it is most likely that they are congenital. Almost all of the hemangiomas in muscle are of the cavernous type. Less than 1 per cent become malignant, although often they are locally destructive.

The presence of a swelling, with or without pain, is the most common complaint. The swelling may be soft or hard, tender or nontender. The size varies greatly, the outline may be sharp or poorly defined, and pulsations and bruits are rarely observed. Elevation or the application of a tourniquet seldom alters the size of the swelling. A roentgenogram is most helpful in diagnosis. Bone changes are observed infrequently, but phleboliths, usually multiple, are found in approximately 50 per cent of cases. Pomeranz and Tunick have stated that the injection of a radiopaque substance is the most accurate aid to diagnosis.

The differential diagnosis and the pathology of these tumors are discussed in detail.

Complete surgical excision under a tourniquet is recommended unreservedly as the treatment of choice. LOVICK E. DICKEY, JR., M.D.

Rupture of the Achilles Tendon; 57 Cases. IB CHRISTENSEN. *Acta chir. scand.*, 1953, 106: 50.

Rupture of the achilles tendon usually occurs during leisure time, often during participation in sports. Lack of training is a predisposing factor. Other predisposing factors include syphilis, tuberculosis, pyogenic infections, tumors, and cysts. Fatty degeneration of the ruptured tendon may occasionally be found. In the author's series of 57 cases, rupture occurred during work in 12 cases, approximately 20 per cent. In a total of 15 cases, approximately 25 per cent, trauma was undoubtedly a factor and was judged sufficient to have caused the rupture. In 40 cases trauma was absent or inadequate, and in some cases rupture was regarded as spontaneous.

The site of rupture was stated in 50 cases. In 47 of these, it was situated less than 6 cm. above the insertion; that is, in the common tendon. The most frequent site of rupture was 2 to 4 cm. above the calcaneus where the tendon is thinnest. The ruptures are transverse and presumably always complete. The result is a separation of the ends of the tendon with a gap, usually not exceeding 2 to 6 cm., but it may vary between 1 and 12 cm.

Errors in diagnosis are frequent. This is true because the preceding trauma is often slight and also because the pain and swelling may be interpreted as due to a sprain at the ankle joint. The differential diagnosis includes sprain of the ankle, malleolar fracture, fracture of the calcaneus, avulsion fracture around the insertion of the achilles tendon, also tendinitis, peritendinitis, calcaneal bursitis, insufficientia pedis, phlebitis, and intermittent claudication.

Concerning the treatment of fresh ruptures, it is nearly always possible to unite the fragments and repair the rupture by end-to-end suture. In neglected cases it is more difficult to overcome the gap due to the retraction of the proximal end.

The technique of surgical repair employed in 39 cases is as follows: The tendon is exposed throughout its entire length by an incision along its medial border to avoid the small saphenous vein. A flap of about 2 by 10 cm. is cut from the proximal tendon fragments so that the continuity is preserved distally. This flap is turned 180 degrees around its attachment so that it bridges the gap. The free end of the tendon flap is sutured to the distal fragment with interrupted sutures. Whenever possible, the ruptured tendon ends are first apposed and repaired with Z sutures. The fold formed where the tendon flap is connected with the proximal fragment is secured against avulsion with interrupted sutures. Heavy monofilar nylon is the suture material of choice. The tendon is sutured while the foot is in the equinus position. The leg is immobilized with the foot in the same position and the knee is flexed to an angle of 120 degrees in a plaster cast extending to the middle of the thigh. After 5 weeks this cast is replaced by a walking cast in which the foot is immobilized in the right angle position.

Restoration of the triceps function was obtained in 90 per cent of the operative cases and in approximately 75 per cent of the nonoperative cases. Surgical treatment seems to offer a favorable prognosis in old, neglected cases just as in recent cases.

KENNETH E. SHERMAN, M.D.

SURGERY OF THE BONES, JOINTS, MUSCLES, TENDONS, ETC.

Synovectomy and Curettage in the Treatment of Tuberculosis of Joints. M. C. WILKINSON. *J. Bone Surg.*, 1953, 35B: 209.

The author records his experience in the treatment of 62 patients with tuberculosis of the spine, hip, or knee. All patients were operated upon for removal of the infected focus by synovectomy or by curettage of the necrotic focus.

Twenty-three patients with tuberculosis of the spine were treated. The operation usually entailed costotransversectomy and evacuation of the abscess, and in some cases filling-in of the necrotic area with bone chips.

Twenty-seven patients with tuberculosis of the hip were treated by partial synovectomy, with or without curettage of necrotic bone foci. Of 23 patients operated upon, treatment was rated as successful in 19 in that the disease became quiescent after operation and a good range of motion was restored.

Seven children with tuberculosis of the knee were treated. All but 1 of these recovered, and active motion was present following treatment. Nine adult patients were treated. Seven of this group regained motion of at least 90 degrees. Streptomycin was used in conjunction with surgery in all of these patients.

Of the entire group, the author considered that only 7 patients failed to respond to treatment.

EDGAR L. RALSTON, M.D.

Arthroplasty of the Shoulder Joint with the Acrylic Prosthesis (Arthroplastie de l'épaule par prothèse acrylique). ROBERT JUDET, JEAN JUDET, and JEAN LAGRANGE. *Rev. chir. Par.*, 1953, 72: 129.

Seventeen arthroplasties with the acrylic prosthesis have been performed on the shoulder joint by the authors since 1947. From their experiences thus far they suggest the following indications for the application of the method:

The first traumatic lesion involving the shoulder joint was one of enormous gravity, consisting of a bursting or splitting fracture with the upper end of the humerus in fragments. This lesion is seen more frequently in the aged subject, in whom the osteoporotic bone is more easily fragmented. The prosthesis relieves the pain and permits a notable increase in the functioning capacity of the articulation. The fragments are not removed without strict indication; however, in one of the authors' patients in whom the pain persisted and became aggravated as a sequela of the operation, the trouble was ascribed to the remaining bony fragments, which produced pain-producing osteophytes and exuberation of the callus.

The second traumatic condition considered is that of a fracture of the neck of the humerus with luxation of the humeral head. This fracture of the anatomical neck usually develops into aseptic necrosis of the head, even when correctly reduced, and a plastic head giving a satisfactory result is considered better than surgical replacement of the fractured articular end of the humerus itself. Even fractures of the surgical neck with extensive displacement of the upper fragment are generally irreducible orthopedically, and many surgeons simply resect the luxated caput humeri in lieu of trying to reduce them or they resort to the method of Lucas-Championnière. In either of these eventualities the shoulder is left practically ankylosed, the position of adduction of the arm being pronounced and the limb being painful.

Eleven patients with conditions coming under these three groups of trauma suitable for acrylic arthroplasty were operated upon by the authors, and all of the results were successful with the exception of the mentioned painful sequelae.

Of the nontraumatic indications, the most important in the authors' experience has been the dry form of tuberculous caries. In the fungus type of tuberculosis of the shoulder joint the acrylic arthroplasty is formally contraindicated. Five patients with the dry form of tuberculosis were operated upon. The first 2 were operated upon without benefit of streptomycin; the last 3 received 100 gm. of this drug by intramuscular injection—50 gm. before the operation and 50 gm. after it. The prosthesis has been well tolerated by all of these patients, the first one having been used for 5 years, and in no instance, even before the advent of streptomycin, did the tuberculous condition recur.

In 1 instance of scapulohumeral arthrosis and periarthritis, an almost total ankylosis of painful

character indicated an acrylic arthroplasty. This operation was successful in relieving the pain; however, the atrophy of the deltoid muscle has largely persisted. The authors believe that in this condition the indication for acrylic arthroplasty will be found to be a rare one, but when present it will be quite valid.

After the operation of arthrodesis of the scapulohumeral articulation the strength of the movements inherent to the superior extremity is generally greater than after simple resection. However, despite the compensations which it brings by the immobilization of the shoulder joint, ankylosis of the scapulohumeral articulation remains a grave handicap, and, therefore, in view of the disadvantages of both resection and arthrodesis, arthroplasty of the shoulder joint appears to represent an important adjuvant to the surgical treatment of disabilities of the shoulder. JOHN W. BRENNAN, M.D.

Diagnosis and Exact Localization of the Lesions by Planigraphy in the Surgical Treatment of Tuberculous Spondylitis under Cover of Streptomycin. SVANTE ORELL and VIDAR BACKLUND. *Acta chir. scand.*, 1953, 106: 61.

A destructive lesion must often be of very considerable size to be visible in the radiograph. By using the method of body section radiography, the confusing shadows that make diagnosis difficult are eliminated and bone lesions can thus be defined with greater sharpness and demonstrated earlier than has hitherto been possible.

Since streptomycin has become available, abscesses and bone lesions can be treated surgically without great risk of spreading or activating the tuberculous process. Surgical treatment is greatly facilitated by accurate demonstration of the presence of the lesions, especially in cases of operative tuberculous spondylitis, in which the bone lesions, anatomically, are difficult of access. Paravertebral abscesses, for instance, cannot be demonstrated without roentgenography, nor can psoas and retropharyngeal abscesses be demonstrated in the early stages. In planigraphy the shadows of the larger part of the vertebral body are blurred out.

The method of taking roentgenograms of layers of an organ has now been employed for two decades, and the details of this technique are well known. To justify its use the following conditions should be met: (1) the presence of a definite indication to determine the seat of the lesions; (2) the state of healing should be estimated, as far as possible, by ordinary roentgenography, and planigraphy should be used only when recurrence is suspected, or at the final examination to demonstrate complete recovery; (3) accurate centering with a small primary diaphragm; (4) in case of collapsed vertebrae with protuberance, planigraphy does not demonstrate details more clearly than ordinary roentgenography, except in paraplegia, where the compression of the cord itself is easily localized by combined air myelography and planigraphy; (5) as few planigrams as possible should be taken in the selected view, and in the selected view only.

The author reports some of the cases from the Department of Orthopedics, in order to illustrate the difficulties encountered in the surgical treatment of spondylitis. Study of these cases reveals that the position and extension of the bone lesions in the vertebral body can be demonstrated more distinctly with planigraphy than with ordinary roentgenography. The development and the healing of the destructive processes can be more accurately determined and the operation can be planned more accurately. Such preoperative planning assists in achieving complete and radical excision of the diseased tissue with a smaller risk of recurrence.

KENNETH E. SHERMAN, M.D.

Open Reduction in Congenital Dislocation of the Hip. E. W. SOMERVILLE. *J. Bone Surg.*, 1953, 35: 363.

In a series of 23 cases open reduction of congenital dislocation of the hip was carried out. The longest time since operation was 3 years, and the shortest time was 6 months. There was no instance of retarded growth in the epiphysis.

This operation was described as simple and quick and unassociated with shock. Figures and arthrograms are presented. The operative technique is discussed in detail, and the author primarily emphasizes that the inverted limbus is very important in the congenital dislocated hip. Among 23 patients operation was done early on 18 and late on 5. The operation is not original, but is a combination of a number of operations. The ages of the patients varied from 11 months to 5 years.

RICHARD J. BENNETT, JR., M.D.

A Reconsideration of Cup Arthroplasty of the Hip, with a Precise Method of Concentric Arthroplasty. J. CRAWFORD ADAMS. *J. Bone Surg.*, 1953, 35B: 199.

The author presents his method of concentric cup arthroplasty of the hip, which was used in 27 cases. The usual Smith-Petersen arthroplasty frequently resulted in pain which was thought to be due to one of three causes: (1) recurrent strain of the capsular ligament permitted by eccentric movement of the femoral head in the acetabulum; (2) local exposure of bone in the weight-bearing area of the joint favored by disparity in size between the moving parts and consequent concentration of pressure in a small area; (3) impingement of the rim of the cup at the base of the femoral neck when the head and neck are short.

In the author's operation, acrylic resin cups have been used. These fit snugly over the cleared head, allowing about one-sixteenth of an inch clearance. A similar clearance is allowed between the cup and the acetabulum. The axis of rotation of the femoral head remains stationary, and the author describes the technical details that he has followed. Of his 27 patients, only one had severe pain; 4 others had

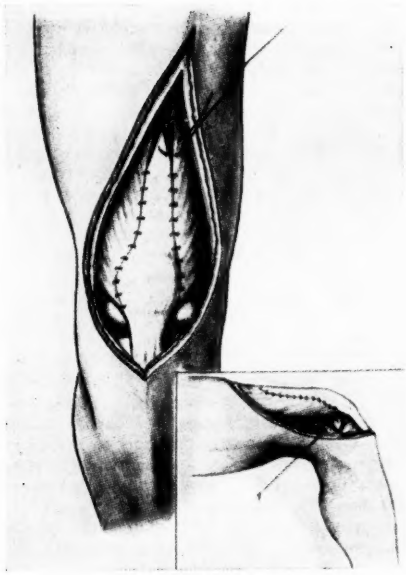

Fig. 1 (D'Aubigné et al).

slight pain on walking. Function was rated as good in all but 4 cases. Of these 4, 2 were rated as fair and 2 as moderate. EDGAR L. RALSTON, M.D.

Fifty Cases of Extension Rigidity of the Knee Joint Treated by Mobilization Operations; Plastic Operations on the Extensor Structures (Cinquante cas de raideurs en extension du genou traités par opérations mobilisatrices; plasties de l'appareil extenseur). R. MERLE D'AUBIGNÉ, J. O. RAMADIER, and J. CASTAING. *Mem. Acad. chir.*, Par., 1953, 79: 544.

True arthroplasties are excluded from this report. The technique of the authors' operation consists in a midline incision from the anterior surface of the thigh, as high as necessary, passing down over the knee and, if needed, over the upper, anterior surface of the tibia. The vastus medialis and lateralis muscles are cut through, and loosened from their attachments to the tendon of the rectus femoris muscle on each side. If necessary, of course, any scars in the rectus femoris itself which limit the movement of this muscle, are excised. The musculotendinopatellar band is then raised. If the patella is adherent to the femoral bone or cartilaginous joint surfaces it is loosened, if necessary, by excision of the patella, and only its anterior cortical attachment is left; later this raw surface is covered with fatty tissue from the joint itself. Any adhesions between the femorotibial articular surfaces are also loosened (bony union between these surfaces would contraindicate this operation), and the fibroadiposely transformed bursal and fat tissue in the supracondylar space is cleaned out and replaced with healthy fat tissue. Attempts may now be made to flex the knee joint, if necessary by lengthening the rectus tendon in the process. The lengthening is accomplished by an inverted V-shaped incision through the tendon (Fig. 1). Finally, the stumps of the quadriceps muscle are sutured to the apex and lateral cut surfaces of the rectus tendon. This leaves the femoral condyles more or less exposed under the cutis and this may be more or less remedied by bringing up the lateral ligaments from the area of the upper end of the tibia and suturing them to the remnants of the patellar structure.

After the knee joint is operated on it is put up in flexion at an angle of 60 degrees or more, and voluntary contractions of the quadriceps are attempted from the following day on. Passive movement is attempted before the end of the first week, and the first attempts at active movement, beginning soon after, are conducted with the patient in the upright position when practicable. Later the patient is encouraged to extend the knee from the sitting position. Re-education of the quadriceps to contract vigorously is carried on, sometimes for years.

Sixty knees in 58 patients have now been operated on (in 2 instances the condition was operated on bilaterally), of which 50 have been observed now for more than 2 years. In this group of 50 patients, the results were excellent in 16, good in 16, and satisfactory in 10. In 4 instances the condition of the patient was not improved perceptibly and in 4 there was failure (ankylosis). About the only serious cause of failure has been the recurrence of an infective process (compound fracture), although the authors also blame, to a certain extent, the traction apparatus which passes a Steinmann nail or other transfixion through the condyles. Incidentally, the authors never apply traction on the femoral bone but always on the tibia.

In the discussion, MATHIEU states that he has been using a similar method, but he disclaims any such results as those reported by the authors. JUDET tells of a series of 25 patients operated on by a similar method, but complains of 3 instances of cutaneous gangrene; he, however, used a curved incision. He believes that when cutaneous cicatrization is important, preliminary cutaneous grafting should be attempted; however, he believes that the markedly flexed position of the knee is responsible for most of the instances of gangrene. Henceforth he intends to immobilize the joint postoperatively in the extended position, at least for a few days.

JOHN W. BRENNAN, M.D.

Severe Traumatic Lesions of the Achilles Tendon in Working Accidents (Lesions graves traumaticas del tendon de aquiles en los accidentes del trabajo). RUBÉN A. CAZORLA PALACIOS. *Arch. soc. cirujan. Chile*, 1952, 4: 243.

The author reviews 43 cases of lesions of the Achilles tendon in patients treated within a period

of 13½ years. Six of these patients received initial treatment in other hospitals. In 19 of the cases reviewed, partial severance had occurred; in 10 there was complete severance; in 3, complete subcutaneous rupture; in 10, partial rupture; and in 1 case, avulsion. The ages of patients ranged from 20 to 40 years in 33 cases; one patient was 14 years of age and another was 59. The mechanism of trauma in 27 cases was severance produced by heavy bodies, steel plates, spades, etc. The cases of rupture were due to lifting heavy machinery, direct contusion of the Achillis region, and (in 2 cases) to sprain of the ankle.

After a brief review of the anatomy and physiology of the tendo achillis, the author describes in detail the operative procedure. He believes that the best and simplest technique is to use heavy silk and nylon sutures in U or X, and that by using these materials infection may be prevented. Immobilization in a long leg cast is used for a period of 25 to 40 days, and then a short leg cast of Unna's paste for 10 to 15 additional days, followed by physiotherapy and kinesiotherapy. Among the complications, the author mentions 4 cases of infection; 3 cases of maceration of the edges of the wound; 2 cases of dehiscence of the wound; 1 case of tenosynovitis; and marked equinus deformity in 3 cases that needed surgery. The average period of hospitalization was 92 days per patient. FELIX STANZIOLA, M.D.

FRACTURES AND DISLOCATIONS

The Perforated Cruciate Intramedullary Nail: Preliminary Report of Its Use in Geriatric Patients. MICHAEL T. MODNY and JOHN BAMBARA. *J. Am. Geriat. Soc.*, 1953, 1: 579.

The perforated cruciate intramedullary nail is a new type of nail which is particularly adaptable to geriatric patients because of its ease of application. It is lighter, shorter, and stronger than the popular Kuentscher nail, and needs only one incision over the fracture site. The method of its application consists of exposing the fragments, reaming the medullary canal, and inserting the cruciate nail in the longer fragment; then through a small osteotomized window the nail is returned by a simple lever action toward the distal or lesser fragment of bone. To prevent a wandering effect of the nail a frictional screw is inserted across both cortices. The small piece of cortical window is replaced. The wound is closed in the usual manner. In many instances the patient is spared the wearing of a bulky plaster of paris cast.

Additional advantages of this nail are enumerated by the authors as follows: (1) the cruciate nail does not have to extend beyond the narrow cavity or into the soft tissues, (2) it may be used in comminuted fractures, (3) it resists greater force than a similar segment of the Kuentscher nail, and (4) it can be used in cases of nonunion and massive bone cysts.

Thus far this method has been employed on 3 patients with good results.

SAMUEL L. GOVERNALE, M.D.

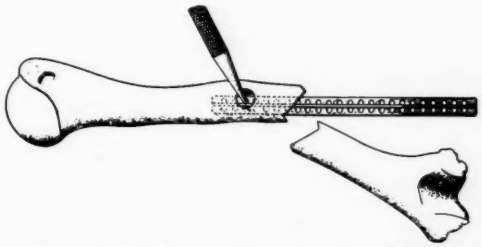

Fig. 1 (Modny, Bambara). The lever is inserted through the fenestration in the bone and into the holes in the cruciate nail. Nail may be inserted in retrograde direction by either the lever or a mallet.

Flexorplasty of the Elbow. Evaluation of a Method. ROBERT E. CARROLL. *J. Bone Surg.*, 1953, 35: 706.

An evaluation of 28 flexorplasties of the elbow, performed over a 20 year period at the New York Orthopaedic Hospital, is presented. Loss of flexor power in the elbow joint is a primary disability in the function of the upper extremity. Steindler's operation of transplanting the common origin of the superficial digital and wrist flexors was used.

All cases were carefully evaluated. In 18 patients loss of flexion was the result of poliomyelitis; in 5 obstetrical palsy was the etiologic factor; and in 5 trauma to the brachial plexus was the cause. Seventeen of the patients were males and 11 were females. Twenty-one per cent of patients were under 10 years of age and 75 per cent were under 20 years. One patient could not be used in the final evaluation because of the unavailability of data.

In general, the operative technique was the same in each case, and is described.

The longest period of evaluation was 17 years, the shortest period was 1 year, and the average period was 6 years. The results were rated as good, fair, or poor. A good result was one in which flexorplasty was a distinct aid to rehabilitation, since it provided a useful range of motion with good to fair power. The elbow joint in this group carried a fixed flexion deformity of about 40 degrees. The result was rated as fair when the patient was improved by the procedure, but when the range of motion, the power of the transplanted muscle, or the position of the limb was not completely satisfactory. A poor result was one in which the patient was not improved. On this basis, 15 (56%) patients were classified as having obtained good results, 7 (25%) fair, and 5 (19%) poor results. In general, the patients' age at the time of surgery seemed to have made no difference in the final results.

It was brought out that the flexor muscles also function as pronators of the forearm, wrist and hand, and when the origin of these muscles is tightened by transplanting it proximally on the humerus a pronated position of the forearm occurs. This is more marked if the supinators are concomitantly weak, but can be prevented by trans-

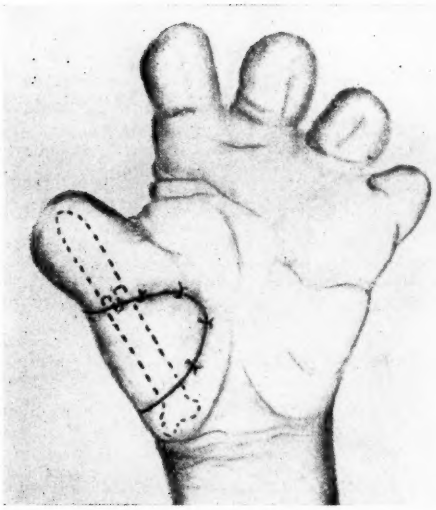

Fig. 1 (Lewin). Palmar view demonstrating relationship of cocked hat flap, bone graft, and skin graft at the completion of the procedure.

planting the flexor carpi ulnaris in such a way as to enable it to act as a supinator. Fixation of the transplanted mass to the anterior rather than the medial surface of the humerus decreased the tendency toward a pronation defect.

The value of arthrodesis of adjacent joints in relation to the result of the flexorplasty was considered. Shoulder fusion had been done in 16 of the patients and contributed greatly to total function of the upper extremity; however, the procedure did not specifically improve the function of the elbow. On the other hand, arthrodesis of the wrist has proved to be of great value in improving the power of flexion.

The 5 poor results were carefully reviewed. In one case the flexor mass had been inadequately mobilized initially, and scar tissue complicated a second attempt at flexorplasty; a second patient did not have the muscle origin transplanted far enough proximally; the remaining 2 patients did not have enough power in the flexor-pronator mass prior to operation to produce elbow flexion. Therefore, errors in technique or inaccurate preoperative evaluation of muscle power were responsible for the failures. LOVICK E. DICKEY, JR., M.D.

Partial Reconstruction of Thumb in a One-Stage Operation. MICHAEL L. LEWIN. *J. Bone Surg.*, 1953, 35 A: 573.

The author calls attention to a procedure designed to reconstruct the thumb in which phalanges are absent but the metacarpal and thenar musculature are intact. A contiguous skin flap reinforced by an iliac bone graft allows lengthening up to 4 cm. The operation is completed in one stage and has the additional merit of imparting nearly normal sensation and tactile sense to the new thumb. A prerequisite is the presence of intact skin along the radial border of the hand.

No suggestion is made that this procedure should replace the method of reconstruction utilizing the transposition of a neighboring finger, but it is believed that it is preferable to the method of repair in which an abdominal skin tube is used, because the skin used is not foreign to the hand and multiple operations are unnecessary.

A case report is presented and the operative procedure is described in detail. A curved radial incision, proximal to the tip of the stump, is used to elevate a "cocked hat" flap, which is mobilized ulnarward just enough to dislodge it from the metacarpal tip. An iliac graft is then shaped and wedged into the marrow of the metacarpal. The flap is then basted down and a split-thickness graft is used to cover the area over the thenar musculature.

LOVICK E. DICKEY, JR., M.D.

Late Results of Treatment of Congenital Dislocation of the Hip. G. M. MULLER, and H. J. SEDDON. *J. Bone Surg.*, 1953, 35: 342.

The authors discuss a group of 264 cases of congenital dislocation of the hip treated over a 50 year period. The average age of these patients when first seen was about 4.5 years. Closed reduction was found to be the method of choice. Open reduction was employed with reluctance. In closed reduction more than half were treated by manipulation and plaster alone.

The results were satisfactory in four-fifths of the patients with unilateral dislocation who were treated before the age of 3 and in two-thirds of those with bilateral dislocation. When immediate open reduction was used, the results in 9 hips were only moderately good. When manipulation was followed by operation in 26 hips, the results were satisfactory in only 11 hips. When closed reduction was used, and when late operation was performed, satisfactory results were obtained in only one-third of the cases. When no treatment of any kind was used, the patients were able to lead a moderately active life, and in one-half of the cases the function was good. When rotation osteotomy was used, only 4 of 9 results were satisfactory.

RICHARD J. BENNETT, JR., M.D.

The Treatment of Subcapital Fractures of the Neck of the Femur with a Nail-Plate and Wedge Osteotomy. J. C. MCNEUR. *J. Bone Surg.*, 1953, 35 B: 188.

The author describes the results of treatment of fracture of the neck of the femur, in which primary osteotomy was used to increase the fracture-shaft angle. The fracture is reduced by the usual technique and a trifin nail is inserted over a guide wire. A wedge osteotomy is then performed just below,

with the apex of the wedge just above, the lesser trochanter. The size of the wedge is determined by the amount of correction that is needed to give a fracture-shaft angle of at least 60 degrees. Fixation is then secured by the use of a plate fitted to the nail and to the femoral shaft.

Postoperatively patients are maintained in skin traction for about 4 to 6 weeks; they are allowed partial weight bearing at about 2 months, and full weight bearing only after roentgenological signs of union are observed. Of the 10 cases reported, 8 patients showed union of both fracture and osteotomy sites, 1 patient died, and in 1, nonunion resulted. EDGAR L. RALSTON, M.D.

Experimental Investigations on the Cause of the So-Called Necrosis of the Femur Head after Dislocation With and Without Fracture in the Hip. (Experimentelle Untersuchungen ueber die Ursache der sog. Kopfnekrose nach Verrenkungen und Verrenkungsbruechen des Hueftgelenkes). JOERG BOEHLER. *Chirurg*, 1953, 24: 344.

Most writers assume that necrosis of the femoral head after luxations or fractures with luxations is caused by disturbances of the blood supply due to tearing of the supplying blood vessels.

The author observed 79 hip luxations with and without fracture. In 17 of these cases partial or complete necrosis of the head occurred. The necroses were most frequent in posterosuperior luxations with fracture (4 of 8 cases) and in central luxations (8 of 32 cases). In all other types of luxations necrosis was quite rare or did not occur at all.

To decide whether direct mechanical trauma to the head or disturbances of the blood supply play the major role in the pathogenesis of head necrosis, the author subjected femurs to high mechanical pressure in a machine used for testing the degree of firmness (resistance against breaking) of building materials. Twenty-nine femoral heads were examined by this method, and a pressure of 300 to 1,400 kgm. was exerted in various positions and angles imitating the conditions prevailing in the mechanism of hip luxation.

The experiments showed that under these conditions infractions of the head occurred in almost all of the cases. However, the resulting deformation may disappear, and the head resumes its normal shape after the pressure has ceased, so that the roentgenogram does not reveal the severe damage caused by the pressure. Such destruction also involves the cartilage in the form of tears and they, too, cannot be seen in the roentgenogram.

From these experiments the author draws the conclusion that the so-called necrosis of the femoral head is caused less by disturbances in the blood supply than by direct traumatic infraction which, however, cannot be visualized in the first roentgenogram.

On the other hand, disturbances of the blood supply seem to be an additional factor. This is borne out by the clinical observation that head necrosis is especially frequent in luxations which are reduced several days after the injury. In the luxated condition the supplying vessels in the capsule, the femur neck periosteum, and in the ligamentum teres (in young patients) are overstretched, and thromboses develop which endanger the adequate supply of the head and give rise to necrosis. This is one more reason why hip luxations should be reduced as early as possible. WERNER M. SOLMITZ, M.D.

ORTHOPEDICS IN GENERAL

Ultimate Results in Tuberculous Coxitis (Risultati a distanza nelle coxitis tubercolari). MARIO BARBERIS. *Arch. chir. ortop. med.*, 1953, 18: 111.

In the 15 year period from 1931 to 1945, there were received in the out-patient department at Milano and at Pietraligure, Italy, 568 cases of tuberculous coxitis. However, the present study has been limited to 485 patients, recently re-examined, or heard from in answer to a questionnaire, after periods of 6 to 20 years. Females comprised 55.5 per cent of this material and males 44.5 per cent. The right hip was the one involved in 233 cases and the left in 244; the condition was bilateral in 6 cases. In 82 per cent of the patients, the disease was initiated before the victim was 20 years of age.

With reference to the etiologic agent, in 45 instances it was pleuritis, in 8 tuberculous spondylitis, and in 29 other tuberculous localizations. Trauma was alleged in 131 instances. In 6 of the patients the tuberculous hip joint involvement developed as a complication of congenital luxation of the hip.

In 55 of the patients the condition was adjudged to be in the initial stage; in 181 it was thought to be less than 1 year old, in 154 from 1 to 2 years old, and in 37, it was 2, 3, or 4 years old. In 58 instances the patient was brought to the clinic for the treatment of sequelae of old, healed-out, tuberculous coxitis.

Treatment in these patients was helioclimatologic (Rollier), medicamentous (lengthy bedrest, tonics, injection of abscesses and fistulas with antiseptics, such as silver nitrate or micobactarin), or orthopedic and surgical intervention. The orthopedic measures consisted, in the main, in the application of plaster casts, with or without orthopedic traction on the limb, ambulatory casts, splints of plaster, or splints of other material.

Surgical treatment consisted principally of extra-articular or para-articular arthrodesis.

The results of medical treatment (in 34 cases) are listed as follows: the cures amounted to 29.4 per cent; the good results (with the joint not perfectly fixed, pain only at intervals, posture of the limb not perfect but permitting the patient to continue active labor without excessive disturbances) amounted to 35.3 per cent; and the poor results (with continuous pain, the hip joint in poor alignment, marked shortening, evident limp, and persistence of the fistulous tracts) amounted to 35.3 per cent, also.

In the surgically and orthopedically treated patients (159) the results, after 6 to 20 years, were

found to be particularly encouraging. In 60 per cent of the patients there was no pain or other disturbances after discharge from the clinic. In 70 per cent, it was possible for the patient to resume his previous occupation, frequently consisting of heavy and exhausting labor. In 76 per cent of the discharged patients there is still a solidly fixed joint in excellent posture present; in fact, the limb was found to be in the same alignment as that given it by the original arthrodesis. In 57.3 per cent of the cases, the patient is now able to walk without any disturbance whatever and he is free of any supporting orthopedic appliance and without evidence of pain or limping. In only 22 per cent of the patients did the condition deteriorate. Today, of course, the last-mentioned 22 per cent will have the benefit of our ample use of antibiotics.

On the whole the satisfactory results in the surgically treated material, after 6 to 20 years, are estimated as comprising 80.4 per cent of all the patients, a percentage which is obviously superior to that which may be anticipated from an analogous material not treated surgically.

JOHN W. BRENNAN, M.D.

The Anterior Compartment (Anterior Tibial) Ischemia Syndrome. WILLIAM H. MORETZ. *Am. Surgeon*, 1953, 19: 728.

That this disease entity is an extremely rare syndrome is attested to by the paucity of case reports. The author reviews 27 cases collected from the literature and reports 4 of his own. Numerous names have been appended to the syndrome. To mention only a few, they are: Volkman's ischemic contracture of the leg, traumatic necrosis of the pretibial muscles, and ischemic necrosis of the anterior tibial muscle. A more inclusive designation of the disease appears to be "anterior compartment ischemic syndrome," which the author suggests for adoption.

Besides a brief description of the 27 cases collected from the literature, the author presents an excellent report of his own 4 cases.

The first case was that of a 70 year old woman who suffered a stroke, fell, and developed an ulcerating inflammatory lesion over the right tibia. Three months later the patient was admitted to the Salt Lake General Hospital for treatment of the ulcer. Examination revealed many advanced organic degenerative diseases of a neurovascular nature. Symptomatic treatment followed. The ulcer measured 3 by 5 cm., and exposed the tibia. Local treatment of the ulcer failed. One week after admission, under local anesthesia, the ulcer was explored. The findings were those of massive necrosis of the anterior compartment of the tibial muscle and thrombosis of the anterior tibial vessels. The necrotic mass was excised and the area was packed with systemic penicillin, streptomycin, and local saline solution compresses. The wound became clear. Secondary closure of the wound was executed with wires and the leg was immobilized in plaster. Six weeks later the cast was removed. The wound appeared healthy save for the exposed tibia, which was osteotomized. Primary closure of the wound resulted in a high temperature, great toxicity, and death 2 weeks later. Autopsy disclosed (among other conditions) multiple fatal pulmonary emboli.

Case 2 was that of a 47 year old male who had been under treatment for endarteritis obliterans. The patient continued to smoke; hence his symptoms were unabated. He suddenly developed pain in the right posterior knee area with loss of pulsation of the lower femoral and popliteal arteries. Paleness, with skin discoloration, appeared over the anterior compartment of the right leg. Within 30 minutes from the time of onset, morphine and papaverine were administered intravenously. Within 2 hours a rightsided paravertebral sympathetic block was executed. Improvement in circulation became manifest; i.e., the right popliteal pulse became palpable and of good quality. Two days after admission, a right lumbar sympathectomy was also performed with further improvement of popliteal, posterior tibial and dorsalis pedis pulsation. Ten days after admission the patient was discharged from the hospital with mild pain in the anterior compartment of the right leg.

Case 3 was that of a man, aged 49, who developed a cramplike pain with swelling of the anterior compartment of right leg. This man had smoked 2 packages of cigarettes a day over a period of many years. No pulsation of the popliteal vessels was noted. The temperature on his right leg was 3 to 5 degrees less than on his unaffected leg. A continuous right paravertebral sympathetic block produced mild improvement in pain and increased temperature. One week after admission a right lumbar sympathectomy was done. Two weeks after sympathectomy the anterior compartment was explored and gangrene of skin, fascia, and profound ischemia of all its musculature was found with thrombosis of the anterior tibial artery. The wound was débrided; however, it became necessary to amputate the leg 3 weeks later.

Case 4 was that of a 37 year old white man with rheumatic heart disease, who developed an embolus in his right posterior tibial artery. The management in this case was somewhat similar to that used in the other cases, but with embolectomy of his femoral artery also, which ensued some time after the first embolization. Three days after embolectomy, a right anterior compartment syndrome occurred. Prompt decompression of the anterior compartment by incising the anterior crural fascia returned the leg to a quasi sound physiological status. This patient was later subjected to a mitral valvulotomy, and was discharged from Salt Lake General Hospital in excellent condition. Thus, early decompression averted irreparable damage to the limb.

Anatomically, the structures within the anterior compartment are the tibialis anticus, extensor digitorum longus, the extensor hallucis longus, and the peroneus tertius muscle, the anterior tibial nerve, and the anterior tibial artery and veins. In the main,

the blood supply to all these structures emanates from the anterior tibial artery.

These patients, and the factors governing the etiology of the syndrome are classed in 3 groups: group I, those in whom there had been strenuous muscular activity; group II, those in whom there had been trauma from external violence; and group III, those in whom neither strenuous muscular activity nor trauma could be implicated.

The pathogenesis of the anterior compartment syndrome is not very clear; however, it is postulated that vasospasm of the anterior tibial artery may lead to the ischemic necrosis. Studies of cadavers disclosed no anastomotic vessels between the anterior and posterior tibial arteries. The only anastomoses were noted from the geniculate artery and the external malleolar branches. Once the vasospasm is established and not interrupted, edema within the anterior compartment ensues, intrinsic pressure augments because of the unyielding anterior crural fascia, and ischemic necrosis of the intracompartmental structures becomes inevitable. Moreover, it is conceivable that thrombosis of the anterior tibial artery is secondary to the vasospasm within the compartment rather than vice versa.

With regard to treatment, the author states that:

1. In the case of an individual with pain and tenderness of the calf muscles and anterior compartment, one should admonish the patient to avoid long marches or the strenuous, prolonged use of his extremities.

2. Where pain, tenderness, induration, and swelling are manifest, strict bed rest is instituted. If no improvement is noted, sympathetic block with efocaine may be indicated.

3. Sympathectomy is reserved for those patients in whom peripheral vascular disease is discernible.

In patients with loss of function of the anterior compartment musculature, such as loss of dorsiflexion of the foot, and sensory losses over the outer aspect of the leg, prompt decompression of the anterior crural fascia is mandatory. The fascia is split in its entirety. Closure of the skin may be unwise should the muscle herniate greatly. Delayed closure of skin may be performed 2 to 3 days after fasciotomy.

SAMUEL GOVERNALE, M.D.

SURGERY OF THE BLOOD AND LYMPH SYSTEMS

BLOOD VESSELS

Definitive Treatment of Fresh Injuries to the Large Blood Vessels. JOHN J. CRANLEY and LOUIS G. HERRMANN. *Arch. Surg.*, 1953, 67: 153.

Blood vessel injury is not often seen by civilian surgeons. This article is a review of the subject with an effort to clarify and explain various factors and offer definitive treatment.

A blood vessel may be compressed, contused, partially severed, or completely severed. Compression usually results from angulation of a fractured bone or from hemorrhage and swelling in an unyielding fascial compartment. Reduction of the fracture with release of the compression or immediate fasciotomy gives adequate relief.

Contusion of a blood vessel is more serious than compression and frequently leads to thrombosis. An understanding of the various mechanisms of vasoconstriction is essential in treating vascular injury. The first of these is the extrinsic control by the autonomic nervous system. A second mechanism is the intrinsic ability of the blood vessels to constrict when irritated. The normal intrinsic tone of the blood vessels constitutes the third method. Relief lies in exposure of the artery with removal of intraluminal clots, spicules of bone, and resection of the injured segment. Papaverine and procaine given locally are the most effective agents for the relief of spasm.

The lapse of time between injury to the vessel and definitive care is vitally important. Operative procedures should be done within 6 to 8 hours, but exploration may be carried out up to 24 hours after injury. Hemorrhage must be quickly controlled. A simple and safe method is by local pressure and elevation of the part above the level of the heart. Fear of wound contamination should not prevent the use of local pressure. Tourniquets should be used only to prevent loss of life. Shock should be treated promptly with blood, saline solution, blood substitutes, and all of the acceptable methods in common use.

Ligation of the vessels should be used only when it does not endanger the extremity. Grafts should not be used to restore continuity when ligation may be done safely. Major arteries may be divided into three groups. First, there are those arteries which may be ligated without complications, such as, all the arteries of the neck except the internal and common carotid, arteries below the elbow and knee, and the left gastric, splenic, and internal iliac arteries. Second are those which can be ligated without serious consequence under ideal conditions, but not under less favorable conditions, which include the internal carotid, subclavian, axillary, brachial, and popliteal vessels. They also include arteries to the abdominal organs except those in the above group, and the renal and hepatic arteries. Third are those in which ligation is always hazardous—the aorta, innominate, common carotid, renal, common and external iliae, and the common and superficial femoral arteries.

Operative methods of repair of lacerated arteries are discussed generally. Various vessel clamps and the use of umbilical tape or white shoe laces are a necessity. Sutures of fine silk (No. 00000 or 000000) on swedged needles are used. Lacerated arteries may be sutured longitudinally or transversely, and suture should be intima-to-intima. In instances in which the defect is too great to bridge, venous autografts may be used with considerable success. Lumbar sympathectomy may be an aid. Anticoagulants, especially heparin, may be of considerable help in many cases. Local use of heat and cold should be avoided. Detailed care depends largely on the circumstances presented by the individual patient being treated. DONALD C. GEIST, M.D.

The Role of Sympathectomy in the Treatment of Frostbite. NORMAN H. ISAACSON and J. BLAINE HARRELL. *Surgery*, 1953, 33: 810.

In an attempt to better determine the possible beneficial effects of sympathetic interruption in the treatment of frostbite of the extremities, the authors have reviewed an experience with 33 cases. The unique feature of the series is that these patients presented themselves with essentially bilaterally equal disease in both lower extremities, and in each case a unilateral ganglionectomy was performed—the untreated extremity being left as a control for evaluation of the sympathectomy.

Twenty-eight of the patients were men and 23 of these were negroes with ages ranging from 22 to 65 years, an average age of 43 years. A great majority of the patients sustained their injury after an alcoholic bout followed by exposure to cold in an unsheltered location. Following unilateral ganglionectomy the treated extremity became noticeably warmer, even when the leg was in the hyperemic stage of frostbite. The extremity showed skin temperatures of 1 to 3 degrees warmer than its partner, and oscillometric readings showed increases of 10 to 50 per cent; otherwise there was no essential difference in the two sides. No more rapid subsidence of edema, no more rapid demarcation of gangrene, and no essential difference in the amount of gangrene or the extent of amputative surgery required was noted. No essential difference was observed between the two extremities in the length of time required for healing to take place.

The sequelae of frostbite fall into three principal groups; deep-seated, dull, aching pain in the feet on walking is the principal disabling factor. It is brought on by weight bearing and relieved by rest, but is relatively rare in frostbite. Sympathectomy is believed to be of the widest application in the treatment of these late sequelae.

Of 7 patients presenting themselves 3 months to 31 years after cold injury, with one or more of the sequelae mentioned, all enjoyed good or excellent results except 1 patient who had undergone operation 3 months after the initial injury. The ulcers disappeared, the circulation improved, and the symptoms subsided.

On the basis of this experience the authors conclude that sympathectomy does not prevent or limit the extent of gangrene when performed early, nor hasten healing once gangrene is established. It does not protect the extremity against repeated cold injury. It is, however, useful in the treatment of the late sequelae of frostbite in that chronic ulcers are healed, parethesias and pain are relieved, and other manifestations of poor circulation are lessened.

ALLAN D. CALLOW, M.D.

Surgical Treatment of Aneurysms of the Aorta; Possibilities of Excision (Traitement chirurgical des anévrysmes de l'aorte; les possibilités d'exérèse). CHARLES DUBOST AND CLAUDE DUBOST. *J. chir.*, Par., 1953, 69: 581.

The majority of aneurysms of the aorta are located in its thoracic portion and are of syphilitic origin.

At the level of the arch, only small aneurysms should be submitted to exploration. Under favorable conditions a lateral sac may be resected but the danger of secondary rupture of the suture line, located within pathologically changed tissues, is great. Resection of the arch, supplemented with a graft, still belongs in the experimental domain. On the other hand, establishment of a shunt, followed by resection of a portion of the thoracic aorta and insertion of a graft, has passed the experimental stage. However, wiring which produces a partial endosaccular coagulation of blood by means of electrocoagulation still remains the most popular procedure.

Atheromatous aneurysms of the abdominal aorta are more easily accessible than those of the thoracic portion. Palliative intervention may be indicated by the patient's advanced age or by the considerable extent of atheromatous changes. Wrapping the aneurysm in cellophane provides at least a temporary prevention of rupture.

Involvement of renal arteries aggravates the prognosis considerably. Results of wiring or progressive ligation of the aorta above the aneurysm are unpredictable.

Resection of the abdominal aorta below the origin of the renal arteries and re-establishment of continuity by insertion of a graft gives very encouraging results; however, follow-up studies over a long period of time are necessary to evaluate the procedure.

In 3 patients, wrapping of the abdominal aorta in polyethylene was followed by very satisfactory results. In 2 patients, resection of the abdominal aorta below the renal arteries, with use of a stored human aortic transplant, was completely successful.

JOSEPH K. NARAT, M.D.

Excisional Therapy of Aortic Aneurysms. MICHAEL E. DE BAKEY and DENTON A. COOLEY. *Am. Surgeon*, 1953, 19: 603.

The authors report their experience with excision and replacement with aortic homograft in 10 cases of aneurysms of the lower thoracic and abdominal aorta. There was 1 death in the series, occurring on the thirteenth postoperative day; the patient was a 74 year old woman who died of progressive uremia and secondary hemorrhage. All of the other patients had an uncomplicated postoperative course. All were over 60 years of age except 2 in whom the aneurysm was of syphilitic origin; in the others the lesion was arteriosclerotic in origin, involving the aortic bifurcation in 5 instances.

On the basis of these gratifying early results the authors believe that excision of the aneurysm and replacement with an aortic homograft is the therapy of choice and provides the most effective surgical approach to the problem of aneurysms of the aorta. The grave prognosis of these aneurysms and the relatively unsatisfactory results obtained by methods favoring thrombosis within the aneurysm and fibroplasia about the wall of the aneurysm indicated the need for a more aggressive approach to the problem.

The authors describe aneurysms in various locations from the ascending aorta to the bifurcation of the aorta. Small saccular aneurysms in which the neck is small and the wall of the vessel is suitable for suture may be excised with lateral arteriorrhaphy. These lesions are usually syphilitic in origin and are most often found in the upper thoracic aorta particularly about the aortic arch. For these lesions the authors prefer a right anterior thoracotomy incision through the second or third interspace with cephalad extension by median sternotomy, or extension into the left hemothorax by transverse sternotomy with a bilateral opening of the chest for lesions involving the ascending and transverse portions of the arch of the aorta. Aneurysms in the lower portion of the aorta are more extensive as they involve a segment of the aorta itself. Those in the abdominal region are more likely to be arteriosclerotic in origin and fusiform in shape. Temporary arrest of the circulation in the aorta distal to the origin of the aneurysm is necessary and in the authors' experience no significant ischemic manifestations were observed following such occlusion above the renal vessels for a maximum period of 45 minutes, and below the renal vessels for a maximum period of 105 minutes. A thoracotomy incision on the left side through the resected bed of the rib opposite the origin of the aneurysm with extension into the abdomen as a thoracoabdominal incision, if necessary, is the surgical approach favored for aneurysms located in the lower thoracic and upper abdominal part of the aorta.

Aneurysms involving one or more of the major tributaries of the aortic arch may necessitate sacrifice of the common carotid arteries, in which cases preoperative tests of carotid occlusion should be made. The carotid artery arising from the aneurysm

itself may be sacrificed without serious neurologic sequelae. Sacrifice of the subclavian artery rarely causes ischemic changes in the corresponding upper extremity, but simultaneous division of the subclavian and carotid arteries on the same side (as for a lesion of the innominate artery) is likely to produce ischemic complications. Following excision of the sac the base is closed with a proximal layer of interrupted mattress sutures of No. 000 silk and the edges are oversewn with figure-eight sutures of No. 0000 silk.

The authors preserved their homografts at a temperature of 0 to 4° C. in the media recommended by Gross and his associates. The longest period of preservation prior to use in their series was 25 days, although they state that this period may be extended up to several months. They utilize a simple continuous through-and-through suture of No. 0000 arterial silk for insertion of the graft.

ALLAN D. CALLOW, M.D.

Aortic Homografting. R. C. BROCK. *Guy's Hosp. Rep.*, Lond., 1953, 102: 204.

Aortic homografts were used to replace segments of the aorta in 6 patients—3 with coarctation of the aorta, 1 with aneurysm and coarctation, 1 with aortic aneurysm, and 1 with Leriche's syndrome (insidious thrombosis of the aortic bifurcation).

The stricture of coarctation of the aorta is usually short enough to allow excision of the strictured segment and end to end anastomosis. Certain local factors (a very long segment of narrowing, a rigid inelastic aorta, or associated aneurysm) may call for insertion of a graft. Unless a homograft is available, one must close the aortic ends completely or turn down the left subclavian artery, a maneuver which has poor results as it does not correct the hypertension. Indications for homografting in the author's patients were a double stricture in one patient, which was treated by resection of the segment of aorta containing both strictures. In the second patient the first pair of intercostal arteries had to be resected with the coarctation, which left a defect of 2.5 cm. The third patient had a long, narrow portion of coarctation which left a defect 5 cm. in length when resected.

The fourth patient had a large calcified aortic aneurysm above the coarctation. When both were resected a defect of 12.5 cm. in length remained. This was replaced by a graft.

A homograft was used in a fifth patient to replace a large abdominal aortic aneurysm, which measured 20 by 12 by 11.5 cm. Fortunately, the entire aneurysm involved the aorta distal to the renal arteries; otherwise the resection would not have been possible.

The sixth patient had Leriche's syndrome. Complete obstruction of the aorta was demonstrated by aortography. At surgery, thrombosis of the aorta extending from just distal to the renal arteries into the superior segments of the iliac arteries was demonstrated. This segment was resected and a homograft which had an aortic bifurcation was used to replace the defect. It measured 9.5 cm. The patient made a good postoperative recovery. Peripheral pulsation returned and she was able to walk one mile without pain. Six months after operation she died suddenly as the result of rupture of a false aneurysm of the aorta into the third part of the duodenum.

Five patients are living with satisfactory results, the longest follow-up period being 18 months.

FREDERICK W. PRESTON, M.D.

New Viewpoints Pertaining to Homeoplastic Blood Vessel Transplantation into the Aorta (Neue Gesichtspunkte auf dem Gebiete der homoioplastischen Gefässtransplantationen an der Aorta). J. WEIS. *Langenbecks Arch. u. Deut. Zschr. Chir.*, 1953, 275: 319.

The healing process of aortic homografts was studied by the author macroscopically and microscopically. The viability of transplants stored in a nutrient solution may be tested by recording their contractility under the influence of heat, oxygen, and epinephrine. However, the greater the number of elastic fibers in the arterial segments, the longer the period during which they preserve their contractility. This factor limits the usefulness of this test.

Maintenance of a blood vessel bank is greatly facilitated by the use of dead, frozen arterial segments.

The author obtained segments of the aorta from dogs within 6 hours after their death. The tissues were preserved in a refrigerator after the addition of penicillin. In 21 dogs the segments were implanted into the thoracic aorta and in 9 dogs, into the abdominal aorta. Interrupted simple sutures were employed in 2 animals, mattress sutures in 8, and a continuous stitch in 20 animals.

Four dogs succumbed to ischemic lesions of the spinal cord, attributable to a prolonged interruption of the blood supply. Interruption of the blood flow for longer than from 22 to 25 minutes is dangerous in this respect.

The danger of thrombosis of the thoracic aorta is very slight. An aneurysm of the abdominal aorta was found in one dog. Strictures can be avoided by a careful suturing technique. The intensity of necrotic processes is variable. Three layers within the transplanted segment may be distinguished; namely, a callus of the intima, a necrotic zone, and a collagenous fibrous layer. The new adventitia seems to invade the media. The histologic changes become stationary approximately 6 months after transplantation. After 1½ years a solid merger of the transplant with the adjoining blood vessel wall can be observed.

In 5 dogs, a segment of the thoracic cava was implanted into the thoracic aorta. A balloonlike dilatation of the transplanted venous segment developed but a rupture did not occur and the vitality of the recipient dogs was undistinguishable from that of the control animals.

The author concludes that arterial and venous homografts undergo necrosis and act as a trellis for the newly formed tissues. It follows that success of transplantation does not depend on the vitality of the transplanted segment and its ability to regenerate. First, cells undergo changes; the mesenchymal basal substance degenerates more slowly but remains viable longer than from 6 to 7 weeks.

JOSEPH K. NARAT, M.D.

Segmental Circulatory Velocity, Studied by Means of Fluorescein Administered Intra-Arterially, in Peripheral Vascular Disease (Il tempo di circolo segmentario, studiato col metodo della fluoresceina per via endoarteriosa, nelle malattie vascolari periferiche). G. TATTONI, F. ASCHIERI, and C. MALCHIODI. *Gior. ital. chir.*, 1953, 9: 252.

The observations here recorded refer to 76 patients of various ages with vascular disease of the obliterative type involving the lower extremities. The lower extremity was chosen because the diseases of the portion of the vascular tree presented in the author's patient material were the only source of statistical conclusions with an incidence rendering such conclusions valid. With the designation "peripheral" the authors intend the sparing of at least a short stretch of the common femoral artery at the upper end of the thigh, a tract which is indispensable for the effectuation of this particular technique of intra-arterial injection.

The method of study used was, of course, basically the method developed by Wolheim and Lang in 1931; however, the immediate technique was that reported by Secco in 1950, as modified by Tattoni and Pizzigoni in 1951, wherein the fluorescein is introduced into the artery instead of the vein and is rapidly demonstrated by means of the histamine wheal. The authors have also had recourse to the auxiliary use of arteriography.

For convenience in observing the material it has been divided into six groups depending upon the portions of the artery involved in the disease process and upon the type of involvement present (complete obstruction, recanalization, development of collaterals, spasmodic obstruction). This classification permits rather uniform types of observational results. However, it was found that, even within the individual groups, the results were not at all uniform. In a certain number of instances in each of the groups, the circulation time and the extension and localization of the arterial obstructive process agreed, so that the exact localization of the segment of the limb involved (from the thigh to the knee, from the knee to the ankle, or from the ankle to the big toe) could be diagnosed without the aid of arteriography. In other instances no such correlation could be established, and the conclusion was forced upon the observer that the obstruction to the blood flow is dependent upon some other circulatory factor than the purely anatomical one. The fluorescein method would seem to be more reliable here in indicating arterial disease than arteriography.

It would thus seem logical to conclude that the behavior of the circulatory velocity can reveal circulatory obstacles which cannot, because of their functional nature, be detected with the arteriographic technique. Therefore, the fluorescein method is a necessary complement to the arteriographic method of studying peripheral obliterative arteriopathies. JOHN W. BRENNAN, M.D.

The Future of Surgery in Senile Obliterative Arterial Disease. CHARLES ROB. *Brit. M.J.*, 1953, 2: 308.

Arteriosclerosis is an increasingly important problem facing the medical profession. In some patients the most abnormal vessels are found in the lower limbs, while in others the coronary or cerebral arteries are most affected. The realization that the symptoms in a high proportion of patients are produced by a relatively short thrombosis is changing the approach of surgeons.

A brief historical review of the many approaches used in the treatment of symptoms of senile obliterative disease is given. All of the approaches have the obvious defect that they are indirect. Leriche is credited with being the first to attack the occluded segment by means of arteriectomy, in 1937. Dos Santos, in 1947, performed the first endarteriectomy for this condition by opening the vessel, removing the thrombus, and then repairing the vessel. Reboul and Laubry, in 1950, reported that in 47 per cent of 93 cases the disobliteration remained patent, in 38 of the cases the blood clotted again, and in 11 cases the patients died.

It is the author's opinion that a better method of treatment consists of replacing the thrombosed segment of artery by an autologous vein graft or a homologous artery graft. In the author's opinion between 50 and 60 per cent of all patients with intermittent claudication or gangrene of the toes have a lesion in their arteries which is anatomically suitable for an artery or vein graft. In actual practice, however, he believes that only 20 per cent or less of these patients can be given such grafts because of cerebrovascular or coronary artery disease. Fontaine and Hubinont, in 1950, reported an experience with 18 grafts, 44 per cent of which were successful. The author utilizes vein grafts when the host vessels are normal or nearly so, and hopes with improvement in technique to use them more frequently in the treatment of senile obliterative arterial disease. An essential and limiting requirement for efficient artery grafting is an artery bank. This direct attack by arteriograft upon the thrombosed segment of an artery has to date been confined to the aorta, its main branches, and the major vessels of the neck and limbs.

The author then gives a brief review of recent work concerned with the resection of portions of the coronary vessels in the dog and other methods of restoring the myocardial blood flow in human beings. Senile obliterative disease of the coronary arteries is often a diffuse process, but in a minority of patients it may be relatively localized and suitable, at least

anatomically, for replacement by a vein or artery graft. Harrison and Wood, in 1949, found that in 15 patients dying of ischemic heart disease, 8 had diffuse disease with all the major coronary arteries narrowed and irregular, but in 7 the disease was limited to one artery, usually the left one, or to part of an artery and the remainder of the coronary tree was relatively normal. In the author's opinion about 10 per cent of the patients suffering from angina pectoris or perhaps early coronary occlusion might receive benefit from an arterial graft to the coronary arteries. Both main trunks of the human coronary arteries are reasonably accessible to the surgeon and both move very little with the heart beat. This latter fact is believed to be important because it should be possible in man to graft the coronary arteries while the heart is beating, an extracorporeal circulation being unnecessary. In some patients with only partial occlusion, ventricular fibrillation might follow interruption of the blood flow, and it is the author's suggestion that in these patients a graft may be put in over a fine polyethylene tube and removed just before the second anastomosis has been completed.

It may well be that in man the treatment of acute occlusion of the main stem of one coronary artery when the other is normal will be an emergency operation to replace the occluded segment of coronary artery by a graft which is followed by excision of the myocardial infarct with repair of the cardiac defect; on the other hand, patients with severe angina pectoris will be treated by a graft if the disease is confined to the main stem of one of the coronary arteries. It is likely that suitable patients for these operations will be rare. The replacement of bleeding intracranial aneurysms by grafts may eventually be possible in a few cases. The selection of these patients should be relatively simple because of the highly developed state of cerebral arteriography.

The author concludes with a reminder that a direct approach to the local manifestations of senile obliterative arterial disease is now a practical possibility. In the future it may be possible to extend the scope for operations of this type, and grafting of the coronary arteries may be performed successfully during the next few years. The most difficult problem pertaining to such grafting is that of relating the symptoms and signs of the disease to the features which will make a graft successful and will prevent unnecessary operations on patients unsuitable for grafting. ALLAN D. CALLOW, M.D.

The Value of Adrenalectomy and Splanchnicectomy in the Treatment of Certain Types of Obliterating Arteritis (De la valeur de la surrénalectomie et de la splanchnicectomie dans le traitement de certaines artérites oblitérantes). RENÉ FONTAINE, RAOUL RIVEAUX, MAURICE KIM, and RENÉ KIENY. *Rev. chir. Par.*, 1953, 72: 193.

Follow-up studies were carried out in 26 of 45 patients who underwent adrenalectomy and lumbar sympathectomy for obliterating arteritis. In 27 per cent, development of the primary condition continued. Of 51 patients who underwent splanchnicectomy and lumbar sympathectomy, a follow-up study was done in 40. In this group, 47 per cent showed no arrest of the process.

The authors arrive at the conclusion that neither adrenalectomy nor splanchnicectomy can be depended upon to inhibit the development of thromboangiosis. New thrombi or aggravation of the primary condition may develop after the intervention. On the other hand, such procedures reduce considerably the risk of recurrent thrombosis, be it in the original location, or at a distant point. This belief is substantiated by the fact that in a group of 96 patients with thromboangitis who had undergone adrenosplanchnic operations, success was recorded in 76 per cent of a selected group of 66 in whom a follow-up study 10 years after the operation could be obtained. In a group of 40 patients in whom sympathectomy alone had been performed, favorable results were observed in only 53 per cent of 23 patients in whom follow-up studies were made.

The authors conclude that an intervention directed against a thrombus as such should be supplemented by adrenalectomy or splanchnicectomy. Both procedures are crowned with success in approximately the same percentage of cases and are recommended only in thromboangiosis and possibly also in certain types of extensive peripheral arteritis.

JOSEPH K. NARAT, M.D.

Results of Restorative Surgery—Thrombectomy and Thrombendarteriectomy, Fresh Venous Grafts, Arteriovenous Detours—in Peripheral Arterial Obliteration (Les résultats de la Chirurgie restauratrice—thromb et thrombendartériectomies, autogreffes veineuses fraîches, dérivations artérioveineuses—dans les oblitérations àrtérielles périphériques). RENÉ FONTAINE, RAOUL RIVEAUX, MAURICE KIM, and RENÉ KIENY. *Rev. chir. Par.*, 1953, 72: 231.

Operations which produce hyperemia and improve collateral circulation, such as sympathectomy or arteriectomy, are followed by excellent results in approximately 50 per cent of cases with thromboangiosis; however, they fail in the presence of extensive or multiple thrombi, or are not applicable where the site of thrombosis makes the intervention dangerous. Aortic bifurcation and iliac arteries belong to the last mentioned category. Under such circumstances operations which produce hyperemia must be replaced or supplemented by other procedures, namely, thrombendarteriectomy, vascular graft, arteriovenous anastomosis, or a combination of the first with the second or with the third operation. The first procedure is called thrombendarteriectomy because the dissection of the thrombus is usually carried between the intima and the media.

In a large percentage of cases in which operations resulting in hyperemia fail to produce improvement, restorative procedures succeed in eliminating the sequelae of peripheral arterial obstruction.

Blood vessel grafts furnish better results than thrombectomy or thrombendarteriectomy. As a rule, arteriovenous anastomosis gives mediocre results but must be performed by necessity when a graft can not be employed. The authors recommend an end-to-end anastomosis.

Thrombectomy combined with a graft is performed in the presence of a thrombus in one common iliac artery if the corresponding artery on the other side is intact.

A combination of thrombectomy with a shunt is frequently unavoidable when an arteriovenous fistula is established. JOSEPH K. NARAT, M.D.

Results of Operations Producing Hyperemia—Lumbar Sympathectomy and Arteriectomy—in Spontaneous Chronic Arterial Obliteration of the Extremities (Résultats des opérations hyperémiantes—sympathectomies lombaires et artériectomies—dans les oblitérations artérielles chroniques spontanées des membres). RENÉ FONTAINE, RAOUL RIVEAUX, MAURICE KIM, and RENÉ KIENY. *Rev. chir. Par.*, 1953, 72: 204.

Unilateral adrenalectomy or bilateral splanchnicectomy diminish the frequency of new obstructions in patients with thromboangiosis. As a rule we are not able to treat the arterial disease as such and are forced to confine our efforts to the prevention of disastrous results of thrombosis of the extremities. For this purpose two methods are at our disposal: the first is based on physiologic principles and aims to produce vasodilatation and to enhance collateral circulation; the second is based on an anatomic concept and attempts to re-establish the circulation by removing the obstacle, replacing the obstructed segment by a graft, or by forming an arteriovenous fistula.

This paper is confined to a discussion of the results of the first method and is based on a detailed analysis of 61 cases. The method comprises 2 types of operations; namely, arteriectomies and interventions on the sympathetic system in the strict sense of the word, such as infiltration of ganglia or periarterial sympathectomy. Leriche was the first to describe the vasodilating effect of resection of the thrombosed arterial segment. This effect can be intensified by a concurrent or subsequent lumbar gangliectomy.

Vasodilating procedures have a better effect upon thromboangiosis than upon arteritis in the same location and in the same clinical stage.

In both groups of cases the success diminishes rapidly with the growing gravity of the condition while, conversely, the number of inevitable amputations rises. Performed in early stages, vasodilating procedures give long-lasting results in approximately 50 per cent of cases.

In thromboangiosis the establishment of a short circuit is easier if the obstruction is low as compared with higher located thrombi.

The authors were unable to establish fundamental differences between the results of gangliectomies and arteriectomies.

In numerous instances the gravity of ischemic phenomena, or the site and multiplicity of thrombi demand that such vasodilating procedures be supplemented by restorative measures applied to the obstructed arteries. JOSEPH K. NARAT, M.D.

Arteriosclerotic Aneurysm of the Popliteal Artery. E. A. HINES, JR., R. W. GIFFORD, JR., and J. M. HASS. *J. Am. Geriat. Soc.*, 1953, 1: 340.

The authors report on 100 aneurysms of the popliteal artery seen at the Mayo Clinic. The commonest cause of aneurysm in this location is arteriosclerosis, which accounted for 92 of the 100 cases. Sporadic cases due to syphilis, mycosis (Brucella), arteriosclerosis and syphilis combined, and trauma were also noted in the remaining 8 patients. Ninety-eight of the aneurysms were diagnosed by inspection and palpation of the popliteal space. The finding of a thrill and bruit is inconstant, and is not essential. Seventeen patients with popliteal aneurysms demonstrated aneurysms elsewhere in the abdominal aorta, femoral artery, iliac artery, thoracic aorta, and the dorsalis pedis artery. Roentgenograms and arteriography, while helpful, are not a substitute for physical examination. The differential diagnosis includes benign tumors such as lipomas and fibromas, synovial herniations (Baker's cyst), and spontaneous or traumatic hematomas. Pulsations may be masked by occlusion from thrombosis and therefore these masses may not pulsate although an aneurysm is present. Special attention must be given to arteriovenous fistula and false aneurysms of the popliteal space. In the former instance there is usually a history of a penetrating wound plus a continuous thrill and bruit.

The complications in 62 of the 100 cases of aneurysm which were followed consisted of acute arterial occlusion by thrombosis or embolus, gangrene (in 24 instances), pressure on veins, rupture of the aneurysm, and pressure on nerves. These complications often appear suddenly and without warning and once one complication has developed in an aneurysm others seem more prone to develop. Forty-nine of the 100 patients seen had complications at their first visit; 13 of the remaining 51 uncomplicated aneurysms became complicated subsequent to the time the patients were seen and many had more than one complication.

In 20 of the 100 cases of aneurysm, amputation of the limb was necessary and 18 of these amputations were among the group of 80 aneurysms for which immediate surgical correction was not undertaken. This is a mortality for limbs of, roughly, 23 per cent, but the figure is thought to be subject to increase as the short follow-up term on these patients increases. The majority of the amputations were performed for gangrene secondary to sudden occlusion.

The worst prognosis exists in that group of popliteal aneurysms which have given rise to an embolus and after the limb has temporarily recovered. While "spontaneous cure" is mentioned in the literature and is attributed to acute occlusion by thrombus, the

resultant ischemia is thought to be a severe handicap; acute occlusion occurred in 24 of the aneurysms in this series. In 33 per cent of the limbs amputation was necessary within 3 months of the acute episode. Of the 16 surviving limbs, only 4 (17 per cent of the original 24 limbs) became useful extremities. It is believed, therefore, that so-called spontaneous cure by thrombosis involves a high risk of mortality for the limbs, and of morbidity. This type of management is not considered desirable.

The authors call attention to the serious prognosis associated with popliteal aneurysm. Thirty-two of the 69 patients in this series died during the period of follow-up, and 6 of the deaths could be directly attributed to complications caused by the aneurysm. All 6 patients suffered toxemia as the result of gangrene.

Surgery has been the only satisfactory method of treatment of the condition, and the only means of successfully thwarting its serious complications. Such treatment is not without danger, however, as the incidence of postoperative gangrene has been estimated at 5 to 15 per cent. There were no deaths among the 26 patients who were treated surgically by these authors. Two instances of postoperative gangrene occurred within 10 days of operation and amputation was required in both cases. In both, the aneurysm was enlarging so rapidly that the distal circulation was severely impaired and the legs were severely ischemic preoperatively. The operations, therefore, were performed as an emergency alternative to amputation.

Eighty-three per cent of the patients in this group who could be followed adequately had excellent results. The limb has been entirely asymptomatic and useful in every respect in order to be so described. The current surgical procedure of choice is total extirpation of the aneurysm with prophylactic lumbar sympathectomy performed either under the same anesthesia or, as in the case of Linton's preference, several days before extirpation. The authors caution that inasmuch as serious complications are prone to develop in popliteal aneurysms, surgical treatment is advocated for any patient whose general condition permits it. After complications develop the risk of surgical treatment is higher, but risk of conservative treatment is also higher. The authors' data indicate that the incidence of subsequent amputation is about three times as great in limbs with popliteal aneurysms that are not treated surgically.

ALLAN D. CALLOW, M.D.

Treatment of Aneurysms of the Peripheral Arteries (Traitement des anévrysmes artériels périphériques). N. OECONOMOS and J. VAYSSE. *Rev. Chir. Par.*, 1953, 72: 147.

A 31 year old patient was injured in 1945 by shell fragments which penetrated into the region of the left axilla. The fragments were removed under local anesthesia; however, the injury to the humeral artery was not noticed. There developed formication and sensation of cold in the extremity. Two months later the diagnosis of aneurysm was made but operation was refused. The symptoms became more pronounced in 1945 and at this time the diagnosis was evident. Aneurysm of the upper third of the humeral artery was confirmed by arteriography. This method disclosed a saccular aneurysm, free of coagulated blood, located above the point of branching off of the profunda brachii arteries.

The aneurysmal sac was of small size and operation was decided upon with the purpose of excising the sac and reuniting the artery by end-to-end anastomosis. When the sac was opened, however, it was decided to do a restorative endoaneurysmorrhaphy. The sac was more or less adherent to the surrounding structures but could be completely freed. The apertures of the afferent and efferent portions of the arterial trunk were visible on the floor of the aneurysmal sac. The defect in the arterial wall was about 1.5 cm. in length and its margins were represented by a collar of exuberant, but normal endothelium.

A well oiled flexible rubber tube was introduced into two branches of the artery and the sac was almost completely cut away. The exuberant endothelial mass was drawn across the aneurysmal opening and approximated by two rows of No. 00 silk suture. The remnants of the sac were then approximated over the suture line as a reinforcement. At the last minute of the original suture, the tube was withdrawn. When suturing was completed and the clamps had been removed, the artery was sealed and permeable. Since the artery showed evidence of spasmodic contraction, the patient was given an intra-arterial injection of novocain and a periarterial sympathectomy was carried out for a distance of approximately 12 centimeters distally.

The operative wound healed without incident and the patient left the service on the fifteenth day after operation. Six months later there was perceptible an arterial thrill at the seat of the extirpated aneurysm; however, the radial pulse seemed as strong as that on the opposite arm. Arteriography at this time disclosed a moderate degree of stenosis at the point of arterial suture. Another arteriographic examination, 12 months later, showed no evident modification of the stenotic condition; however, the vascularization of the limb appeared normal and the pulse was still strong.

The authors believe the publication of this case is justified by the fact that but few reports of this type of operation for aneurysm are available, but they do not recommend the measure as a routine procedure; in fact, they believe that these aneurysms should be operated upon early, while the aneurysmal opening from the artery is still small, and that end-to-end anastomosis is the ideal method where it is practicable.

They regard the type of operation to be performed as a matter of individual judgment, and believe that the surgeon should be guided in his decision by the conditions found at operation.

JOHN W. BRENNAN, M.D.

The Preparation and Preservation of Arterial Homografts. Experimental Study. P. L. BRUNNEN. *Guy's Hosp. Rep.*, Lond., 1953, 102: 194.

Arterial grafts are difficult to obtain. They must be taken while still sterile, within 10 hours after death, from young persons in good health, who have met sudden death. Because of the scarcity of grafts an arterial bank is useful.

Working with dogs, in the Thoracic Unit of Guy's Hospital, London, the author has grafted abdominal aortic segments prepared in one of four ways: (1) frozen, (2) experimentally infected, frozen, irradiated, and stored frozen, (3) stored in formalin, (4) placed temporarily in formalin and then frozen.

The best results were obtained with frozen grafts which had been prepared by freezing for 48 to 72 hours at −75 degrees C., followed by storage at −20 degrees C. Segments used had been stored as long as 204 days. Eight grafts prepared in this manner gave satisfactory results.

Sixteen grafts were similarly prepared except that they were contaminated with a mixture of common pathogenic bacteria. After freezing, each graft was irradiated with an electron beam of 1.5 million roentgen equivalent physical units. After these grafts were thawed preparatory to use, organisms were recovered by culture from one of the sixteen. Grafts prepared in this manner, as well as those stored in formalin or hardened in formalin prior to freezing, were unsuitable for use and thrombosis at the site of the graft usually occurred.

An important part of the technique of placement of these grafts was the use of a continuous everting mattress suture of No. 00000 arterial silk upon an eyeless curved round-bodied 16 mm. needle.

FREDERICK W. PRESTON, M.D.

Late Results Following 293 Operations for Varicose Veins. Significance of Surgical Procedure and Communicating Veins. FRITS R. MATHIESEN. *Acta chir. scand.*, 1953, 105: 376.

The authors suggest that among the many surgical procedures advocated for the treatment of varicose veins, high ligation of the greater saphenous vein combined with retrograde injection of a sclerosing agent into the distal stump of the vein appears to be gaining in favor. The immediate results appear to be good but the late results are less well known. A review of the reported results of treatment is carefully presented by the author.

During the period from 1943 to 1950 a total of 271 patients underwent operations for varicose veins at the Rigshospitalet, in Copenhagen. Bilateral operations were performed in 101 patients, making a total of 372 limbs with varicose veins. There were no immediate complications of phlebitis or embolism. The follow-up period of study ranged from 1 year to 8 years, an average of 3.8 years. Twenty per cent of the patients were lost to follow-up.

Complete cure or noticeable improvement was found to be present in about 82 per cent of this series, but the operative results could be considered as ideal in only 38 per cent. Of a total of 293 operations, 179 consisted of high ligation and retrograde injection, 53 consisted of excision of the greater saphenous vein by the Babcock stripping technique, plus retrograde injection in most cases, and the remainder a number of different procedures. Although the author favors the use of elastic bandages, none of these patients wore one following surgery.

The late results appear to be best after removal of the long saphenous vein in the thigh (53 patients), particularly when the procedure is combined with retrograde injection into the distal stump. It was noted by the author that fewer incompetent communicating veins were present following this type of procedure. As the time of follow-up increased in length, it was noticed that in general the incidence of recurrences also increased. As far as varicose veins are concerned, the results of operation did not appear to be dependent upon the patient's age. EDWARD F. LEWISON, M.D.

Endophlebohypertrophy and Phlebosclerosis. The Left Innominate Vein and Superior Vena Cava. MARGARET C. LITTMAN, MAURICE LEV, and OTTO SAPHIR. *Angiology*, 1953, 4: 301.

This report deals with the study of 103 superior vena cavas and 79 innominate veins removed from patients during routine autopsies. The veins were opened immediately following removal and their gross architecture was observed. They were then fixed in 4 per cent formaldehyde solution and numerous sections were taken in the longitudinal and transverse planes, embedded in paraffin, and stained specifically with various stains.

Endophlebohypertrophy begins at birth and, in the popliteal vein, is represented by longitudinal streaks and plaques at the mouths of tributaries and adjacent to the popliteal artery. In the external and common iliac veins it occurs not only in those areas but also adjacent to contiguous bones and muscles. Histologically, the plaques consist of a proliferation in the direction of the blood flow of elastic, muscle, and collagenous tissue of the intima and the intimal aspect of the media, and an increased amount of intercellular substance. With increasing age, these plaques become deeper, broader, and firmer.

The concomitant histologic changes are called endophlebosclerosis. The latter alterations consist of (1) basophilic staining, vacuolization, and lacunar formation of the ground substance, (2) disruption and loss of elastic fibers, (3) loss of muscle cells, (4) fragmentation of the internal elastic lamella, (5) increased and decreased staining of the glycoprotein and reticular components of the basement membranes around muscle and elastic fibers of the intima, and (6) replacement by fibrous connective tissue. Where there is increased venous pressure, the process of endophlebohypertrophy and sclerosis is more widespread and severe.

The present report deals with similar changes in the left innominate vein and superior vena cava. A

study was made of (1) the functional gross anatomy of the vein and its changes with advancing age, (2) the microscopic architecture, and (3) a comparison of the gross and microscopic architecture of the vein with and without increased venous pressure.

It is concluded, from this study and previous reports, that endophlebohypertrophy and endophlebosclerosis appear to be local reactions to mechanical stress. This stress was attributed to the presence of the tributaries and to pressure by the contiguous artery which causes local disturbances of blood flow. In the iliac veins, muscle and bone act as additional factors of stress. In the superior vena cava the heart exerts a force on the lower segment and the lung exerts a force on the upper segment. The right pulmonary artery lying posterior to the superior vena cava exerts a transverse stress. When the right peribronchial lymph nodes are involved in a pathologic process, there is compression and constriction of the superior vena cava. At these points gross plaque formations and microscopic changes are most severe. In the innominate vein contiguous arteries and tributaries appear to exert mechanical stress.

The severity of the process of endophlebohypertrophy and endophlebosclerosis is much less in the superior vena cava and the innominate vein than in the popliteal and iliac veins. This is probably related to the force of gravity exerting a force below the level of the heart.

The processes of endophlebohypertrophy and sclerosis are described in the left innominate vein and superior vena cava. These were found to be qualitatively the same, but quantitatively much less marked than in the iliac and popliteal veins. The mildness of the process is considered to be related to the relative lack of external stress upon the veins, and the lack of the force of gravity acting below the level of the heart. As in the iliac veins, increased venous pressure in the innominate vein and superior vena cava was found to increase the extent and the severity of the processes of endophlebohypertrophy and endophlebosclerosis, in addition to increasing the thickness of the media. This is probably due to the combined effects of a tangential and lateral force.

J. H. MOHARDT, M.D.

BLOOD; TRANSFUSION

Apparent Exceptions to Landsteiner's Law of ABO Blood Groups. JOYCE D. SCORAH and P. ASPINALL. *Vox Sanguinis*, 1953, 3: 51.

Landsteiner is quoted as having written that the agglutinogens' designated AB, can be lacking, or one or both can be present in a given individual, and that the serum contains those iso-agglutinins which react upon the agglutinable substances not present in the cells. This law has been confirmed many times, and it is recommended that the ABO group be determined by examination of both the red cells and serum. The author describes the blood of 3 patients which at first examination was considered to violate Landsteiner's law in that it was deficient in agglutinins, but further investigation disproved this. Two theories are commonly considered when the origin of agglutinins is questioned. One states that they are the product of gene action, while the other maintains that they are products of immunization because they are absent at birth and develop during the first year of life and that further, AB substances are ubiquitous in nature. Bloods which violate Landsteiner's rule, if the gene origin theory is correct, must come from people lacking the gene, those with a possible mutation, or people possessing the gene but without sufficient penetration to manifest itself. On the other hand, if the heterogenic theory is correct, then people whose blood violates Landsteiner's rule must either be inert to the antigenic action of heterogenic A-like or B-like substances, or they have not been exposed to them. The latter is a very unlikely position. The 3 patients presented in the report might well have been classified as lacking the expected agglutinins had not the author extended the technique of grouping the bloods. It is recommended that in bloods which apparently violate Landsteiner's law several detailed investigations be carried out: (1) the agglutinins must be tested at 4° and 20° C., for the agglutinins may be so weak as to react only at their thermal optimum, 4° C., (2) the serum must be serially diluted and tested against the appropriate cells and saline, albumin; antihuman globulin serum rich in fraction 1 must be used, (3) the lack in agglutinins must be confirmed over a long period as it may be only a temporary suppression, (4) the technique used for testing the agglutinins must be a precipitin tube method with a weak cell suspension of fresh strong reacting cells for a minimum of 2 hours at 20° or 4° C. and the results must be read with the aid of a microscope, (5) if the serum is apparently lacking in anti-A, it must be tested against both A_1 and A_2 cells at a suitable temperature with the precipitin tube technique, (6) if the serum is apparently lacking in anti-B agglutinins it must be tested against a series of group B cells, (7) the agglutinogen content of the red cells must be rechecked with the precipitin tube method, including a test with group O serum particularly for detecting the subgroups of A, and these tests must be carried out again at 4° C. as well as at 20° C. The author states, therefore, that if the blood still appears deficient in agglutinins when these tests have been carried out, then it can possibly be stated that bloods exist which violate Landsteiner's law. To date the author is not aware of any such blood having been reported after these exhaustive tests. ALLAN D. CALLOW, M.D.

LYMPH GLANDS AND LYMPHATIC VESSELS

Injuries to the Large Lymph Ducts. A. LEE MCGREGOR. *Brit. J. Surg.*, 1953, 40: 569.

The functions of the lymphatic system include a mechanism for the return of blood stream proteins

and other substances which have leaked from the blood capillaries to the blood, the transport of neutral acids, fatty acids, and esters, the extrahepatic formation of globulin and antibodies, and the creation of a barrier against particulate matter and infection. Of 22 traumatic fistulas reported in the literature following operation in different parts of the body, all showed a tendency to close spontaneously. Two new cases of traumatic injuries to the main lymph ducts are reported by the author. Each occurred following a first stage thoracolumbar sympathectomy on the right side. The leak was noticed during the course of the procedure and the two ends of the duct were exposed and ligated. In each case convalescence was uneventful and the patient was discharged from the hospital some 10 days after operation.

Lymphatic fistulas apparently are due to disease or trauma. The latter is often the result of operative injury. The prognosis is considered to be better in the traumatic variety than in that following disease. Accidents involving the spine or thoracic cage rarely result in chylothorax, but when it occurs it is usually situated on the right side because of the fixation of the receptaculum chyli and the thoracic duct by the diaphragm. Chylothorax may occur on either side of the chest as a result of injury during operation. Operations on the sympathetic ganglionated chain, aorta, and esophagus carry a considerable risk of injury to these great ducts. It is estimated that nonchylous lymph is lost in considerable amounts up to 250 c.c. during the first 24 hours after radical mastectomy or groin clearance. Such wounds may discharge clear lymph for some weeks but the patient is little the worse. When, however, chyle escapes from the thoracic duct into the pleural cavity the patient rapidly loses weight and life is jeopardized. While repeated tappings may result in healing of the leak, often enough the pleural cavity continues to fill with chyle and operative intervention becomes imperative.

After experience with the operative type of fistula and a review of the literature the author established certain laws of the great lymph ducts. Basically lymph is life, the large lymph ducts are not essential to life, and chylothorax threatens life. It has been found experimentally that it is all but impossible to cut off the entry of lymph into the vascular system. Any flow of chyle should be traced to its origin and appropriate action taken.

In relation to the thoracic duct and cisterna chyli, stoppage of the leak is essential. In other situations leaks are usually insignificant and if not readily prevented, they may be safely left to look after themselves. Injury to the cisterna chyli or thoracic duct is important only inasmuch as lymph may be lost to the exterior. The cisterna chyli may be removed without detriment to the organism and the thoracic duct may be tied without harmful consequence. Both the duct and the cisterna may be in anomalous locations. Chylothorax is said to cause death by inanition. It is a condition which is amenable to surgery, and operation should be undertaken if a brief trial of conservative measures fails. Lymph, like bile, does not clot and therefore the divided duct should be ligated if loss is considerable. The author believes that unabsorbable material, but not silver clips, are suitable for this purpose. No drainage is considered necessary. The correct treatment in injury of the great lymph duct is recognition of the accident at the time of operation and the institution of appropriate treatment. In conditions of health any large lymph trunk may be ligated with impunity.

ALLAN D. CALLOW, M.D.

SURGICAL TECHNIQUE

OPERATIVE SURGERY AND TECHNIQUE; POSTOPERATIVE TREATMENT

Cardiac Resuscitation. SANFORD E. LEEDS. *J. Am. M. Ass.*, 1953, 152: 1409.

The subject of cardiac resuscitation is of great importance because delay of only a few minutes in beginning treatment may make the difference between a dead or disabled patient and a living and well one. It is important to have a predetermined plan of action and to have equipment available in order to avoid delay. Cardiac arrest or ventricular fibrillation may occur during any surgical procedure, even in a tonsillectomy with the patient under local anesthesia. It can occur during bronchoscopy or esophagoscopy; hence, anyone who performs major or minor surgery under anesthesia must be familiar with the technique of cardiac resuscitation. The cardiologist or internist who performs catheterization of the heart not only should be aware of the possibility that cardiac arrest or ventricular fibrillation may develop during the procedure but also must be prepared to treat it, since there is usually no time to call someone else to resuscitate the patient. As yet, the author is not aware of any case that has developed on a hospital ward in which the patient has been successfully resuscitated. This indicates the need for preparation to handle this emergency when it occurs outside of the operating room by keeping a resuscitation kit available. The kit should contain a scalpel and other instruments, some drugs with syringes and needles, a means of providing oxygen under pressure for artificial respiration, and a defibrillator. Such mobile equipment is already available in some hospitals.

When cardiac asystole develops during the induction of anesthesia or during an operation, it is usually the anesthetist who first becomes aware of the absence of the pulse and blood pressure. The surgeon can verify this quickly by noting whether there are pulsations in an artery in or near the operative field. If the heart is in the field, the surgeon may be the first to observe that it has stopped, and he may notify the anesthetist. When cardiac arrest occurs, the vital functions of circulation and respiration must be maintained artificially until the heart can resume its normal function if the patient is to survive with an intact cerebrum.

The anesthetist starts artificial respiration through a mask or endotracheal tube (preferably the latter) and supplies 100 per cent oxygen with positive pressure. Should cardiac arrest develop in the ward or in some location away from the operating room, mouth-to-mouth forced respirations may be carried on until an anesthesia machine or other respirator can be brought to the scene. The anesthetist or some other person designated to perform the task keeps track of the time and notes the time at which procedures are started or drugs administered.

The surgeon may take a few seconds to prick the heart with a needle mounted on an empty syringe in order to see if it will resume a normal rhythm. Pricking the heart with a needle is indicated if asystole is present but is of no use if there is ventricular fibrillation. Since fibrillation is present in only a small percentage of cases (estimated at 10%), the maneuver is permissible, but only if not more than 10 or 15 seconds are required.

After confirming the absence of arterial pulsations, the surgeon exposes the chest and makes an incision in the fourth or fifth left intercostal space reaching from the left border of the sternum to the axilla. There is no bleeding and the incision is quickly carried through the pleura; care should be taken to avoid injury to the left lung. The surgeon inserts his hand into the chest and starts massage. The heart is firmly squeezed in order to express as much blood as possible by each contraction of the hand. The rate of contraction should be as rapid as possible, but each contraction should be completely effective. In cases in which the heart is small, as that of an infant, the rate can be maintained easily at 80 to 100 per minute, but if the heart is larger, the rate will probably be slower. Occasionally it may be necessary to compress the heart with two hands. Effective massage is tiring and the surgeon should be relieved by an assistant so that efficiency is maintained. Proficiency in massage may be acquired by practice on experimental animals. It is easier to insert the hand into the chest if an assistant holds the fourth and fifth ribs apart until a self-retaining rib spreader can be inserted. Additional exposure is gained if the adjacent costal cartilages are divided. If cardiac massage is not effective with the pericardium intact, the pericardium should be opened so that the surgeon may better grasp the ventricles with his hand. Should bleeding from the chest wall occur during massage of the heart, the assistant may clamp and tie the vessels. The skin may be painted with an antiseptic solution, and sterile towels may be applied after massage is initiated.

The need for haste is plain. The anesthetist or surgeon may not discover the absence of arterial pulsations for a minute or more. It has been determined experimentally that the central nervous system is damaged after 4 to 6 minutes of anoxemia. A rule of thumb is that the circulation and respiration must be started artificially before 2 or 3 minutes have elapsed if the patient is to survive without damage to the brain.

Once respiration and circulation are maintained artificially, the patient's condition improves, the pulse and blood pressure are obtainable, and there is no longer need for haste.

While respirations and cardiac massage are being maintained, fluids, such as a solution of 5 per cent dextrose in distilled water or blood, should be administered intravenously. The fluids will increase the return of venous blood to the heart and support the circulation.

The next problem confronting the resuscitation team is that of returning the heart to a normal rhythm. When the heart is in asystole, it may stay in that condition for a variable length of time. According to present knowledge, it will either return to normal rhythm or change to ventricular fibrillation. If the heart returns to a normal rhythm that is weak with poor contractions, epinephrine should be given in amounts of 0.5 to 1 c.c. of a solution made by mixing 1 c.c. of a 1:1,000 solution with 4 c.c. of isotonic sodium chloride solution. This preparation should be injected into the auricle, and the injection may be repeated every 3 minutes. If the heart remains in asystole for 5 or 10 minutes and appears to be losing its tone, epinephrine or calcium chloride may be administered very cautiously in small dosage, since ventricular fibrillation may develop if the irritability of the myocardium is increased. Procaine hydrochloride and procaine amide (pronestyl) hydrochloride are contraindicated in asystole because they may further depress a myocardium that is not contracting. In adults, atropine should be administered intravenously in amounts of 0.01 grain (0.6 mgm.), especially in cases in which the vagovagal reflex appears to be responsible for the arrest.

Mention should be made of the drugs that are useless or contraindicated in cardiac resuscitation. Analeptic and sympathomimetic drugs, such as caffeine, nikethamide (coramine), pentylenetetrazol (metrazole), strychnine, ephedrine, amphetamine (benzedrine), phenylephrine (neosynephrine) hydrochloride, and p-(2-aminopropyl) phenol (paredrine), should not be used. Drugs that stimulate the central nervous system increase the oxygen demand; in cases in which there is anoxia, the danger of damage is aggravated. Medicaments such as digitalis and strophanthin act on the auriculoventricular conduction system to increase the refractory period and to slow the rate of conduction; they should also be avoided.

Should ventricular fibrillation develop, single or serial shocks may be applied with the defibrillator prior to the administration of procaine. Should the shocks fail to produce a normal rhythm, procaine or procaine amide hydrochloride should be given to aid in defibrillation. Procaine hydrochloride is administered, 10 c.c. of a 1 per cent solution, into the auricle; 200 mgm. of procaine amide hydrochloride should be administered either intravenously or directly into the auricle. Ventricular fibrillation may revert to a normal rhythm with massage alone in human patients.

The defibrillating current is effective because it produces cardiac arrest that may be followed by a normal rhythm. By passing a strong shock through the myocardium, all the wayward contractions of the myocardium are stopped, and, once a regular rhythm is resumed, the contractions may be improved, if weak, by the administration of epinephrine. After the heart has resumed a normal rhythm, the chest is closed with absorbable surgical sutures. An underwater seal drain may be used. Oxygen is administered as needed and antibiotics are employed for several days. BENJAMIN GOLDMAN, M.D.

Blood Levels of 17-Hydroxycorticosteroids in Surgery and Allied Conditions. C. FRANKSSON and C. A. GEMZELL. *Acta chir. scand.*, 1953, 106: 24.

It has been shown experimentally that surgical trauma increases the activity of the adrenal cortex and produces an increased release of adrenocortical hormones. The administration of adrenocortical extract clinically to surgical patients has been shown to have a beneficial influence. Evaluating the activity of the adrenal cortex is very difficult. However, increased activity of the adrenal cortex usually results in a decreased number of eosinophils. Increased excretion of 17-ketosteroids or 11-oxysteroids in the urine indicates increased activity.

By the use of a method described by Nelson and Samuels in 1952, it has been possible to measure the levels of adrenocortical steroids in the peripheral blood before, during, and after a surgical operation. A total of 13 adult patients operated upon in the surgical department were investigated. The patients suffered variously from pulmonary tuberculosis, cancer of the stomach, cancer of the colon, endometriotic growth of the colon, gastric or duodenal ulcer, acute cholecystitis, chronic salpingitis, lacerations, or fractures.

In the authors' opinion and from the present methods of evaluating the activity of the adrenal cortex, the determination of the 17-hydroxycorticosteroids in the blood seems to give the best information. The test seems to be particularly of value in governing the postoperative course. If the trauma produces an immediate shock, the level of 17-hydroxycorticosteroids in the blood seemsto stay low until the shock has subsided.

The authors conclude that the number of eosinophils, the amount of 17-ketosteroids excreted in the urine, and possibly the erythrocyte sedimentation rate are all able to reflect the activity of the adrenal cortex in connection with surgery and allied conditions. Their value is limited, however, because other factors may influence them.

KENNETH E. SHERMAN, M.D.

The First Postoperative Days. A Study of Pre-Ileus Following Gastrectomy. D. EBRILL and L. NAFTALIN. *Lancet*, Lond., 1953, 265: 411.

The occasional unpredictable failure of patients to progress satisfactorily during the first few postoperative days after subtotal gastrectomy led the authors to investigate 150 gastrectomies performed under standard conditions by one of the authors. In spite of slight variations from case to case demanded by

the findings at operation, the procedures done were subtotal gastrectomies and the mortality and morbidity figures were stated to have been well within the accepted limits. Postoperative treatment followed the generally accepted lines with the patients receiving blood and saline solution during and immediately after operation. The stomach contents were aspirated hourly and water was permitted by mouth 24 hours after the operation, with an increase of 1 ounce per hour until by the end of the third day the patient was taking bland fluids and progressing rapidly to a light diet.

Because approximately 90 per cent of the patients seemed to do well following a wide variety of postoperative schedules and 10 per cent did poorly irrespective of the particular regimen used, the conception arose that in the cases doing poorly the patient might well be coming to operation in a state of electrolyte imbalance greater than that to which the body can readily adjust itself. It was found that the serum potassium level by itself was not a reliable guide to the balance of body electrolytes and consequently complete analyses of the urine and aspiration losses by the method of cumulative balance were employed to determine the effects of drip therapy during the critical postoperative period. After an analysis of some 8 cases responding poorly to the immediate postoperative management because of electrolyte imbalance of varying degrees the authors constructed a new regimen.

The scheme was correlated with the fact that the posterior pituitary antidiuretic hormone causes antidiuresis for 24 to 36 hours after operation and the adrenocortical hormones play a part in sodium retention which continues until the third day. During this period there is a coincident potassium excretion which may be related to the amount of tissue breakdown, the rate of urinary excretion, and the inability of the renal tubules to conserve potassium. With the revised management the patient is continued on a light caloric intake up to 6 hours before operation, at which time he is given a high caloric fluid meal consisting of an egg mixed in milk to which protein concentrate has been added. Water by mouth is encouraged until 12 hours before operation and thereafter fluids are restricted. If an electrolyte imbalance exists an oral mixture of potassium chloride and phosphates is given as soon as possible and in such a way that an additional intake of 16 milliequivalents of potassium per day is insured. Gastric lavage is omitted, but the stomach is emptied on the operating table. Blood is given as required during the operation and from the time of operation gastric aspirations are done at 6 hour intervals. Twenty-four hours after operation a slow intravenous drip of 0.18 per cent sodium chloride and 4.3 per cent glucose is started and continued until the third day when it and the gastric aspirations cease. Not more than 2 liters are given intravenously in 24 hours and less than this amount may suffice. Water by mouth, 1 ounce hourly, is given for 24 hours after operation, and when 10 ounces of urine have been passed, usually about the thirtieth hour, 1 ounce of potassium salts mixture is substituted for the water. Between 36 and 48 hours after the operation the patient receives hourly an addition of 1 ounce of water, with a further increment on the third day. Usually by the time the fluid intake reaches 3 ounces hourly it may be discontinued and the patient is moved rapidly to bland fluids and a light diet. The authors believe that at least three factors are concerned in the production of preileus: (1) potassium depletion (about 125 to 150 milliequivalents) which takes place fairly rapidly during the first 48 hours, (2) a sodium-potassium imbalance of about 300 milliequivalents, and (3) a reciprocal sodium-potassium relationship, which in the normal organism Gamble has termed the "Bunge phenomenon."

The authors' data point to the possibility that this relationship continues in a modified form after operation, making it incorrect to discuss either sodium retention or potassium loss or gain in isolation. Their data confirm the views of Gamble that potassium chloride alone cannot be used to replace potassium. The mixtures of potassium and sodium have proved effective both by mouth and by the intravenous route. The oral potassium salt mixture formula is given and provides 59 milliequivalents of potassium per 600 c.c. This concentration may be doubled and still be acceptable by some patients with the result that only half the amount of water need be drunk. The intravenous administration of the potassium sodium mixture provides a potassium concentration of 51 milliequivalents per liter.

ALLAN D. CALLOW, M.D.

ANTISEPTIC SURGERY; TREATMENT OF WOUNDS AND INFECTIONS

Frostbite Resulting in Amputations. THOMAS J. CANTY and ANDREW G. SHARF. *Ann. Surg.*, 1953, 138: 65.

A comparative study of 15 cases of frostbite with major tissue necrosis is presented. All patients were from the Marine Corps in the Korean campaign. A plan of conservative management was instituted in order to preserve as much as possible of an extremity which was permanently damaged. The conservative program was outlined for these patients as follows. They were put at rest, and gangrenous tissues were allowed to demarcate. Each individual case was allowed to recover as much tissue as possible, and no predetermined levels of amputation were established. All of the patients were young and healthy individuals free from associated diseases. After demarcation was complete, amputation was carried out through adjacent, normal-appearing tissues, provided the external criteria of a normal vascular supply could be demonstrated. These criteria were reached by studying the vascular supply by leg-raising tests and oscillometric examinations, as well as by extensive skin temperature studies. It was found that often the blood supply to the original amputation site was

insufficient, especially in the most distal types of amputation. A breakdown of the primary suture line often occurred, and a secondary further débridement and revision of the original amputation site had to be carried out. An average of 5 operations was required in order to achieve a satisfactory stump. If further sacrifice of the length of bone was undesirable, a primary split-thickness skin graft was often applied to cover the tissue defect.

In 67 per cent of the cases presented a major portion of the hand or foot was preserved.

The total hospitalization revealed that 1 patient was hospitalized for 5.5 months, and 14 patients were hospitalized for a period of from 8 months to 1.5 years. JOHN E. KARABIN, M.D.

Injuries of the Hand. JOSEPH L. POSCH. *Surg. Clin. N. America*, 1953, 33: 1081.

Injuries of the hand are common in the practice of most physicians. In 1951, the National Safety Council reported that there were 700,000 occupational accidents involving the hand and forearm. Despite the fact that the hand is exposed and subject to many injuries, there is a tendency to neglect such trauma. Not only does the patient frequently pay little attention to an injury of the hand, but there is a tendency for the profession to consider such injuries of minor importance. In many hospitals they are considered under the questionable term of minor surgery, and assigned to the least skilled of emergency personnel.

It is imperative that injuries to the hand receive the most skillful care since this structure is an intricate mechanism and loss of function causes great hardship, especially in individuals who earn their living by use of their hands.

An adequate history should always be taken in any type of hand injury. The determination of the etiologic agent is especially important. In any injury of the hand, the time from the original accident to the time of surgery should be carefully ascertained, for it has an important bearing on treatment. Primary repair of tendons and nerves should not be carried out if there is danger of infection.

The proper diagnosis in any injury of the hand is based on sound concepts of physiology and anatomy. Lacerations of the tendons and nerves can be diagnosed by routine examination.

Involvements of the median and ulnar nerves give changes involving the intrinsic muscles of the hand, along with sensory changes.

Cut flexor digitorum sublimis and profundus tendons are manifested by the inability to flex the distal two phalanges of the finger. A severed flexor digitorum profundus is manifested by the inability to flex the distal phalanx of the finger. The most common missed diagnosis is that of a lacerated flexor digitorum profundus as a result of a very small laceration over the proximal two phalanges of the finger. The diagnosis of laceration of an extensor tendon is determined by the inability to extend the proximal phalanx of the finger.

Lacerations that involve tendons, nerves, and bones should be repaired under excellent operating conditions. The wound when first seen should be wrapped in a dry sterile dressing. Bleeding may be controlled by pressure or, if necessary, a blood pressure cuff may be used as a pneumatic tourniquet. Thin, narrow rubber tubing or narrow cuffs should not be used to stop bleeding because of the nerve damage that occasionally results.

In severe injuries, general anesthesia is often the best choice. In less severe injuries, or if the patient may have been eating or drinking just before suffering his injury, a local type of block may be utilized.

The hand should be thoroughly washed in soap and water for at least 10 minutes. Some of the newer detergents do not appear to be harmful to the soft tissues and may be used, but they are no better than soap and water. During the washing procedure, the hand is thoroughly irrigated several times with normal saline solution. The fingernails should be cleansed and cut short; if necessary, a scrubbing brush may be used on the fingers but not on the wound itself. Antiseptic solutions are not poured into the wound, or for that matter, ever used on the skin, for with the color they impart it is often difficult to determine whether cyanosis of skin flaps is present.

A blood pressure cuff is always used on the upper arm to control bleeding. A towel or sheet wadding is wrapped about the upper arm, then the blood pressure cuff is placed over this. The cuff is held in place by means of roller gauze. The cuff is inflated to approximately 150 mm. of mercury above the patient's blood pressure, and left on from 1 to 1.5 hours, and then removed. Bleeding vessels are clamped and ligated. At the end of 10 minutes the cuff may be inflated again and left on until the procedure is finished. When this method is used properly, the authors have had no difficulty in obtaining a bloodless field.

Incisions in the fingers should not cross flexion creases but should be made midlaterally. In the palm they may follow the flexion creases. It may appear to be easier to identify elusive tendons and nerves by making a longitudinal incision in the middle of the palmar aspect of the finger. Some tendon function may be obtained in this manner, but the resulting contracture with marked limitation of extension nullifies any flexor power that may have resulted.

In severe injuries of the hand, such as punch press injuries, cornpicker injuries, and so forth, one should attempt to save all viable tissue. Fractures must be adequately reduced. The use of foreign material for fixation should be avoided if at all possible. Occasionally, a stainless steel wire may be utilized if absolutely necessary. The employment of the universal metal splint, as described by Mason and Allen, is excellent in severe crush injuries to maintain the hand in position of function and to reduce the fractures. In less severe injuries, or in those

involving only one finger, reduction may be maintained by traction or splinting in a semiflexed position. A fractured finger should never be placed straight out on a splint, or immobilized with a banjo type of splint with a straight pull. Severed tendons are best repaired after the fractures have healed. Adequate skin coverage must be provided.

Whenever there is loss of skin, attempts should be made to cover the denuded area. This can be done by split-thickness skin grafts, sliding grafts, or pedicled grafts. It is considered extremely important to obtain good skin coverage on any exposed bone or tendon.

In severe roller injuries when skin has been destroyed, a split-thickness skin graft may be used to cover the defect temporarily. Later, full-thickness or pedicled grafts may be applied if necessary.

If large areas of skin are avulsed and are still attached at one end, the subcutaneous tissue may be removed and the full-thickness skin replaced as a graft. If large areas of skin are lost a pedicled graft may be raised from the abdomen and placed over the injured hand immediately in order to preserve the remaining tissues. The site on the abdomen where the pedicle has been raised is covered with a split-thickness skin graft, so as to provide a closed wound and thereby cut down on the amount of drainage that occurs from the granulating surfaces. These pedicles are detached at the end of 18 to 21 days, and then sutured in place to the hand.

In amputations involving the finger it has been said one should attempt to save as much length as possible. However, adequate soft tissue padding must be provided, even at the sacrifice of some length of the digit. A long volar skin flap and a short dorsal one is ideal. This is important, for unless good skin flaps are provided a sore tender stump will result. The nerves are identified, sectioned sharply, and allowed to retract into the good soft tissue proximal to the site of amputation. Vessels are carefully identified and ligated. Flexor tendons are not sutured to the extensor tendons at the end of the stump, for it has been noted repeatedly that limitation of motion of the other fingers results. If the amputation is at the joint, the prominent head of the distal portion of the phalanx is narrowed and the cartilage is removed so that the skin will adhere to the bone. In injuries to the thumb, attempts should be made to save all of the length possible.

Digital nerves can, and should, be sutured at every opportunity. It is folly to do an excellent job suturing a tendon and ignore the nerves. Later, the patient may have fairly good motion but he will complain persistently of numbness of the finger. This result can readily be prevented by careful suture of the digital nerves at the time of the original repair. Digital nerves are sutured with fine suture material. Following the suture of a digital nerve, ulnar or median, return of sensation usually occurs.

Lacerated extensor tendons can be readily repaired with interrupted fine suture material.

In the finger, adequate exposure is obtained by making a midlateral incision. It is usually necessary to make a transverse incision in the distal portion of the palm to identify the proximal portions of the severed tendons. Contracture of the muscle bellies in the forearm occurs and the tendon ends are usually retracted proximally for several centimeters. One should not grasp blindly for the proximal end with a hemostat, as the tendon sheath and the end of the already traumatized tendon may be injured. "Tendons should be handled gently; never crushed, rubbed, or allowed to become dry." By making a proximal transverse incision in the palm, the end is readily identified. Once the tendon is brought into the wound and retracted as far distally as possible, a straight needle is placed at right angles through it, superficially, to prevent its disappearing into the wound again. This may also be done with the distal tendon if it appears to retract into the wound.

The tendon ends are now freshened with a sharp razor. Suturing of the ends should be as atraumatic as possible. Fine suture material is extremely important. The authors have used Koch's method of placing a simple mattress suture of fine silk on either side of the tendon. One may also use wire at a distance, as suggested by Bunnell.

The most common query that one hears is, "What do you do with the tendon sheath?" This, as Mason and Bunnell have repeatedly emphasized, is excised both above and below the sutured tendon. The sutured tendon is then allowed to come in contact with the subcutaneous tissue. In addition, the fibrous portion of the tendon sheath must be split to allow sliding space for the sutured portion of the tendon. This is extremely important, for in healing the tendon swells and it would adhere to the sheath if it were not open. This procedure of excising and opening the tendon sheath is an important factor in obtaining a good result in primary tenorrhaphy.

If both the profundus and sublimis are severed in the finger, it has been advocated (by some) that only the profundus be repaired. The sublimis is cut short at its insertion, while the proximal end is sutured to the proximal profundus in the palm. In the palm and the wrist, however, both the deep and superficial tendons should be sutured. In the palm the lumbrical muscle can be placed between the two sutured tendons.

Postoperatively, the hand is dressed in the best position to relax the tendons. This can be done with a plaster-of-Paris splint or with metal. For extensor tendons the wrist and fingers are moderately extended. If only one extensor tendon to a finger is involved, only that finger and the one next to it need be placed in a splint. It is not necessary to place all of the fingers in extension. For flexor tendons, tension is removed from the sutured tendon ends by moderately flexing the wrist with the fingers slightly flexed. Acute flexion of the fingers into the palm, after a primary repair in the tendon sheath, usually results in their staying that way when attempts to resume motion are undertaken.

The hand is kept elevated for several days; a sling is used when the patient is ambulatory. Care must be taken to insure against swelling, and the dressings should be loosened the day following surgery. Skin sutures should remain in place for more than a week. The supporting splint is worn for 3 weeks, and then gradually increasing exercise is started.

JOHN E. KIRKPATRICK, M.D.

Sclerosis and Surgical Treatment of Large Cavernous Angiomas (Terapia sclero-chirurgica dei grossi angiomi cavernosi). A. BISSI. *Tumori*, Milano, 1953, 39: 199.

In a previous publication (*Tumori*, 1949, 35: 259) the author discussed the possibility of curing certain types of angioma with sclerosing solutions and the choice of the solutions to be applied. Here he discusses the results which may be anticipated from the injections of 1 c.c. of the oleate of monoethanolamine into some huge angiomas. A series of 14 photographs and 3 photomicrographs show the condition in each patient before and after the injection.

After the injection of this liquid the coagulation of the blood in the tumor begins at once, and when seen through the mucosae the color changes rapidly to a deep cyanotic tinge. While these changes are taking place in the angiomatous mass, the tumor is not squeezed or otherwise disturbed. No embolic manifestations have been apparent. It is thus believed that the vessels of immission and emission are rather few and small.

A photomicrograph in the original article shows the subsequent disappearance of the vascular lacunae, and a tendency of the endothelium to sprout inward in the lacunae which are not immediately obliterated. Another photomicrograph shows that the tiny intratumoral nerve twigs do not show any signs of injury from the injection.

In the very large tumors the same dosage and technique is used and it may be repeated daily for as long as necessary without apparent harm.

In especially extensive and massive angiomatous tumors the healed process may remain as a hideous nodular mass of cicatricial tissue. For this reason the author recommends that these huge nodules and blocks of sclerotic tissue be excised, a surgical maneuver which, in the author's experience, is easily and bloodlessly accomplished. The excisions of these residual cicatricial masses is proposed both for the sake of the esthetic results to be expected and to forestall any tendency toward recurrence of the vascular anomaly. In the small angiomas such an excision will not be required as the cicatricial residuum is insignificant and the lesion is entirely cured by the injected solution. In the large tumors there are apt to be some small lacunae which escape the sclerosing process, and later they may serve as a nidus for the redevelopment of the dilatation of the blood vessels in their vicinity.

The author has (as his photographs demonstrate) procured some startlingly favorable results in angiomas which would not otherwise have been operable, and therefore he strongly recommends this technique to the profession.

JOHN W. BRENNAN, M.D.

Serogenetic Brachial Plexus Neuritis Following Prophylactic Injection of Tetanus Serum for Industrial Accident (Serogenetische Brachialplexusneuritis nach prophylaktischer Tetanusseruminjektion als Arbeitsunfallfolge). C. L. PAUL TRUEB. *Chirurg*, 1953, 24: 289.

The criteria for determining a causal relationship between an industrial accident and polyneuritis following the prophylactic injection of tetanus serum include (1) proof that the accident occurred during work, (2) a description of the nature and origin of the injury as well as of the special work engaged in by the victim at the time of the accident that necessitated a prophylactic injection of tetanus serum, (3) the time of onset, symptomatology, and course of the polyneuritic syndrome must conform with these factors of the serogenetic polyneuritis, and (4) proof of the accident-related origin of the serogenetic polyneuritis by demonstration of unavoidable paralysis following the injection of the serum. Any deviation from the acknowledged type of course and symptoms of the polyneuritis will demand individual confirmation that the condition is actually related to the accident in spite of the atypical course or symptoms.

A case in which this relationship was questioned is reported in detail. A construction worker was run over by a wagon which crushed his left leg and inflicted a dirty wound on his right temple. On admission to the hospital he was given a protective dose of tetanus serum (3,000 AE). Ten days later he complained of the first neuralgic pains in his left arm and on the twelfth day he complained of burning pains in both arms and shoulders with gradually increasing weakness of his arms and inability to move them (December 12 to 20, 1951). Examination in 1953 by a neurologist revealed bilateral polyneuritis of the brachial plexus with paresis of the left serratus muscle, both deltoids, and the right biceps, weakness of both index finger flexors and both hypothenar muscles, and partial loss of the use of his left arm.

The diagnosis of a serum etiology was rendered difficult because the hospital record mentioned no signs of serum sickness. However, anamnesis revealed that 3 to 4 days after the injection there appeared a general exanthem with itching, and from 5 to 7 days after the injection there was burning pain in the arm and shoulder.

The presence of a serogenetic polyneuritis of the arms was acknowledged in spite of the atypical course and signs of serum disease based on the following facts:

1. The syndromes of a serum injection developing from 6 to 10 days after injection may be very transitory, mild, and uncharacteristic, thus escaping the attention of the physician.

2. Such transitory serum reaction syndromes may develop within an interval of 5 to 10 days following

the serum injection, the polyneuritic syndrome acting as an equivalent for a nonmanifest serum disease.

For these reasons, the polyneuritis in this case was acknowledged as being due to the prophylactic serum injection and compensation was granted. It is suggested that in the future, tetanus vaccination and the prompt surgical treatment of wounds may render serogenetic polyneuritis a preventable disease.

EDITH SCHANCHE MOORE, M.D.

Treatment of Tetanus with Intravenous Thiopentone and Pethidine. ALAN P. GRANT and J. W. MCNEILLY. *Irish J. M. Sc.*, 1953, 6: 212.

The ideal requirements of a drug in controlling tetanus spasm are as follows:

1. A wide safety margin between muscular relaxation and respiratory paralysis.
2. Rapidity of action
3. Ease of administration
4. No immediate side effects
5. No accumulative toxic effects
6. Reduction of metabolism
7. Mental sedation and amnesia.

Avertin has the disadvantages of potential toxicity to the liver and causing difficulty in controlling the depth of anesthesia. Mephenesin may produce hemoglobinuria. Curares, although extremely useful, have no wide safety margin. Among the curares, succinylcholine is extremely satisfactory especially in the continuous drip method, but it is likely to result in respiratory paralysis.

Barbiturates would be safe from accumulative toxic effects and have a fairly wide safety margin. Thiopentone is the barbiturate of choice, especially its intravenous drip method of administration. Pethidine in the combination reduces the doses of thiopentone.

The authors treated tetanus in a 20 year old boy successfully as follows: thiopentone (0.4 per cent solution) was given for the first 14 days by the intravenous drip method, together with pethidine (100 mgm.) given at 6 hour intervals intramuscularly. In addition, antitetanic serum and antibiotics (penicillin and aureomycin) were given.

During the whole progress the patient's nutrition was scrupulously attended to, and bronchial suction through an endotracheal tube was life-saving on two occasions.

IPPU FUKUDA, M.D.

ANESTHESIA

Divinyl Ether in Anesthesia of the Adult (L'ether Divinylique dans l'anesthesie de l'adulte). J. BOUREAU. *Anesthésie, Par.*, 1953, 10: 232.

The author directed his study toward the finding of the place of divinyl ether in anesthesia. The study consists of the use of the anesthetic in 63 gynecological operative procedures. In 13 of these the anesthesia was used as an induction, in 33 cases as a total anesthetic of short duration in minor cases, in 17 the drug was used for momentary anesthesia during drainage of an abscess, or in punch biopsy. Morphine and scopolamine were always used for premedication. Both open and closed methods were used.

If the anesthetic was to be effective beyond 3 or 4 minutes, the author found it difficult to maintain satisfactory anesthesia. Actually the author believes that the procedure should be limited to 1 or 2 minutes if divinyl ether is to be the only anesthetic used. If the anesthetic is to last longer than this, a closed method must be used. He comments that the anesthesia is a smooth and pleasant induction. Deep anesthesia with divinyl ether alone is impossible; therefore it is not used in abdominal operations.

Recovery is rapid, usually in 5 minutes or less. Only 3 patients suffered nausea, and only 2 had any vomiting.

Changes in respiration consisted of rapid and irregular breathing during the transition to deep anesthesia. This condition disappeared quickly. The lid reflex and ocular movement were maintained late in anesthesia. Muscular relaxation was never produced. As the sole anesthetic in a closed method, the anesthesia was fairly satisfactory for 5 to 20 minute operative procedures; however, because of movement of the patient the anesthetic was regarded as of mediocre quality. With regard to induction for a deeper anesthesia by one of the gases or other anesthetic agents, divinyl ether proved quite satisfactory but not superior to other agents, particularly the barbiturates which are believed to be even better in short cases than divinyl ether. The author believes that divinyl ether should replace ethyl chloride for short operative procedures because it is less toxic and has fewer after effects.

THOMAS C. DOUGLASS, M.D.

Succinylcholine; Clinical Trends and the Technique of Controlled Administration (Chlorure de succinylcholine; essais cliniques et technique de "relachement controle"). G. WALLEMACQ. *Acta Anesthesiol. belg.* 1953, 4: 53.

Succinylcholine is a quick acting curarizing agent which is rapidly eliminated from the body and therefore its effect is of short duration. It is particularly helpful in obtaining muscular relaxation for short procedures such as tracheal intubation, reduction of fractures, closure of the peritoneum, and electroshock therapy. It may also be given drop by drop to obtain muscle relaxation for longer periods of time.

The author states that he employed this drug in 150 surgical operations and in 29 electroshock treatments. The ages of the patients varied from 5½ to 87 years. No untoward reactions were observed.

Preoperative medication should consist of the administration of atropine, 0.5 mgm., and pantopon, 10 to 20 mgm., an hour and a half preoperatively.

The administration of 0.1 to 0.4 mgm. of succinylcholine per kgm. produces muscle relaxation of from 1 to 5 minutes' duration without affecting respiration. Doses between 0.5 and 1.0 mgm. per kgm. cause muscle relaxation of 5 to 10 minutes and

complete respiratory paralysis necessitating artificial respiration. For most short procedures, doses of 0.5 to 0.6 mgm. per kgm. (25 to 50 mgm.) are adequate. No appreciable effects on the blood pressure, cardiac rhythm, electrocardiogram, electroencephalogram, or intestinal motility have been observed from these doses. Succinylcholine does not cause the liberation of histamine as does tubocurarine; the duration of its effect is prolonged by prostigmine, and slightly prolonged by atropine. No antagonistic or potentiating effects between succinylcholine and hexamethonium or pentamethonium have been observed with doses ordinarily used.

Succinylcholine has the same disadvantage that all curarizing agents have, in that undesirably long periods of apnea may be produced. Cholinesterase is a specific antidote for succinylcholine.

FREDERICK W. PRESTON, M.D.

SURGICAL INSTRUMENTS AND APPARATUS

A New Technique for the Rapid Transfer of Abdominal Skin Flaps. J. C. MUSTARDÉ. *Plastic & Reconstr. Surg.*, 1953, 2: 454.

The techniques generally accepted for full thickness resurfacing of large defects at distant sites, such as the face or leg are reviewed. The great disadvantage of the current methods of migrating full-thickness flaps of skin is the prolonged period of time necessary for the successful completion of the transplantation. A flap of abdominal skin with a length to width ratio of 2 to 1 or greater cannot safely be raised and implanted on the wrist for migration without several staged "delaying" procedures. The accepted procedure of raising a 2 to 1 bipedicled flap as the first stage of a tubed pedicle depends for its success on the proved fact that a moderate-sized square of abdominal skin may be raised safely with any one of its sides as a base. The bipedicled flap resembles two squares, each with an adequate blood supply.

Utilizing the principle of square flaps of skin, each with its own blood supply, the author has devised a technique of applying a 2 to 1 flap directly to the wrist for migration at the first operation to obviate a lengthy delay period.

Technique of procedure. A rectangular flap is outlined on the abdomen and one end is incised. The middle third of each side is left attached, but the remaining portions of the sides are severed and the entire flap is undermined. The underside of the flap is covered with a split-thickness graft and the free edge is attached directly to the wrist (Fig. 1). The side pedicles of the flap may be severed in 5 days after preliminary clamping and the use of the atropine absorption test has demonstrated adequate circulation. The remaining end of the flap may be severed from the abdominal wall in 5 to 9 days and the flap is then transferred to the recipient area.

Three cases are presented. In each, the lateral pedicles of the flap were divided by the fifth day; the flap at this point could be considered similar to a Gillies' tubed and pedicled flap which had been "delayed" on the abdomen for the usual requisite period and then attached to the wrist for 5 days. Subsequent migration to a defect in the leg was successful in 2 cases. Failure in the third case was largely caused by too early detachment of the remaining end of the flap from the abdomen.

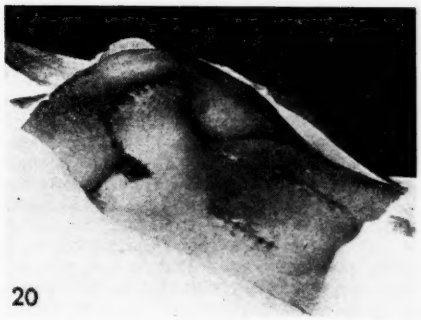

Fig. 1 (Mustardé). Immediate suture of end of abdominal flap to wrist.

ROBERT A. WISE, M.D.

Operability in the Young and the Aged. WARREN H. COLE. *Ann. Surg.*, 1953, 138: 145.

The importance of geriatric surgery has increased with the prolongation of life expectancy of the population. In 1900, the life expectancy was 48 years; in 1950, this figure had risen to 68.27 years. More significant is the fact that between the years 1930 and 1940 the population of the United States increased only 7 per cent whereas the number of people living between the ages of 65 and 74 increased by 35 per cent and the number over 75 had increased 38 per cent.

The author has compared the physiologic factors, and the preoperative, operative, anesthetic, and postoperative considerations in the aged and the young. He has also presented an analysis of the mortality rate in 3,656 major operations performed on the general surgical service of the Illinois Research Hospital in Chicago during the 5 year period from 1948 through 1952.

Physiologic differences. As the age increases, the reserve of certain organs and body functions is lowered. The elasticity of the arteries and arterioles decreases with age. This would explain the susceptibility of elderly patients to vascular shock, renal dysfunction, the effects of heat and cold, and the effects of hypoxia and anoxia. Malnutrition with its implied deficiencies is more prevalent in elderly than in young patients. With increased age, functional impairment of the gonads, adrenal cortex, and thyroid implies certain hormonal deficiencies which may affect the nitrogen metabolism and bone marrow activity. Elderly individuals have been shown to be more susceptible to infection and to tolerate in-

fections less readily than young persons. The total blood volume per kilogram of body weight has been shown to be lower in elderly people than in the young and this is probably explained by the more than 100 per cent increase in total body fat in the older group. Despite these deficiencies and physiologic differences, experimental and clinical evidence would indicate that the healing power of tissue is as efficient in the elderly patient as in the young patient.

Preoperative care. Because of the noted physiologic deficiencies in the aged patient and the fact that these individuals tolerate emergency surgery and complications less readily than younger patients, preoperative preparation and all that this implies is more significant in this group than in the younger more resilient patient. Such correctable deficiencies as decreased blood volume, serum protein, and fluid and electrolyte aberrations should be determined and repaired before operation is performed. Cardiovascular and pulmonary reserve should be thoroughly evaluated so that the limits within which the surgeon and anesthetist may work are known. Within recent years, hormonal therapy has been stressed as a preoperative factor and ACTH and cortisone have been found to be of specific value in certain cases.

Anesthesia and operation. Regional local anesthesia should be used whenever possible. All other anesthetic agents should be chosen with discrimination and hypoxia carefully avoided. Preanesthetic medication should be administered in decreased dosage. Operative time is kept at a minimum, without careless technique and rough handling of the tissue.

Postoperative treatment. The elderly postoperative patient must be treated with vigor but also with discrimination. He usually will tolerate less intravenous fluids, particularly saline solution. He must be encouraged to move about and cough in order to avoid pulmonary complications. Tracheal aspiration, bronchoscopy, and tracheotomy are used relatively more frequently because of the tendency to accumulate mucous and subsequently develop atelectasis. Early ambulation may be very helpful but it should not be abused. Postoperative sedatives are given sparingly. Because of the tendency toward malnutrition, oral nourishment should be started as soon after operation as possible. The five major causes of postoperative death in elderly patients in order of frequency are: cardiac failure, pneumonia and atelectasis, peritonitis, pulmonary embolism, and renal failure.

Analysis of cases at the Illinois Research Hospital. In an analysis of 3,656 major operations performed on the general surgical service at Illinois Research Hospital between 1948 and 1952, inclusive, the overall mortality rate was 2.95 per cent. In 2,557 major operations in patients under 60 years of age, the mortality rate was 2.07 per cent, as compared to the rate of 5.1 per cent in 1,099 patients over 60. In operations such as radical mastectomy, cholecystectomy, gastrectomy, herniorrhaphy, and thyroidectomy, the mortality was similar in the two groups. In operations of greater magnitude such as esophagectomy, pneumonectomy, and radical excision of the rectum the mortality in the older age group was more than twice that in the group under 60 years of age.

In operations for lesions about the mouth and neck, the mortality in patients over 60 years of age was more than ten times as high as that noted in patients under 60. This is explained by the fact that in the older group most of the operations were performed for carcinoma.

Although cholecystectomy alone did not appear to be sufficiently formidable a procedure to reflect a difference in the two age groups, the combined mortality rate for cholecystectomy, choledochostomy, and choledochoplasty was exactly 10 times greater in the patients over 60 years of age than it was in the group under 60.

HARVEY N. LIPPMAN, M.D.

PHYSICOCHEMICAL METHODS IN SURGERY

ROENTGENOLOGY

Upward Displacement of the Posterior Part of the Third Ventricle. A Method for Its Evaluation. GIOVANNI RUGGIERO and FRANCESCO CASTELLANO. *Acta radiol.*, Stockh., 1953, 39: 377.

Increased pressure from tumors of the posterior fossa can cause herniation of the brain stem and the superior portion of the cerebellum through the incisura tentorii. However, previous methods of determining this radiologically have been unsatisfactory, chiefly because of uncertain or variable landmarks.

Fifty normal individuals and 50 persons with lesions of the posterior fossa were studied by drawing a line perpendicular to the clivus (or a line which prolongs it upward) which is also tangential to the anteroinferior portion of the third ventricle. The relationship of this line to the rostral end of the aqueduct was studied and it was found that this line is below the rostral end of the aqueduct in the presence of tumors in the posterior fossa; and it is further below with intraparenchymatous than with extraparenchymatous tumors. The line is either at or above the rostral end of the aqueduct in normal cases. JOHN J. GAUGHAN, M.D.

Roentgenologic Recognition of Habenular Calcification as Distinct from Calcification in the Pineal Body. HERBERT M. STAFFER, LEO B. SNOW, and ANDREW B. ADAMS. *Am. J. Roentg.*, 1953, 70: 83.

Habenular calcification can be recognized in lateral skull roentgenograms as a "C"-shaped calcification in the pineal region, with the open portion of the "C" directed posteriorly. It represents calcification in the taenia habenulare and is separated from the pineal body by the habenular commissure. The development of the suprapineal recess with the attachment of the choroid plexus at the taenia habenulare provides an explanation for the presence of calcification lying as a cap over the anterior surface of the habenulare commissure. Its position averaged 5 to 8 mm. anterior to the center of the pineal body calcification in the present series. The characteristic habenular calcification was identified in 89 of 187 normal skull roentgenograms showing calcification of the pineal region.

In order to establish the accuracy of the relationship, lateral roentgenograms were made of blocks of tissue including the pineal region removed from the brain specimens.

When only a small segment of the taenia is calcified, positive identification is possible only when the pineal body is distinctly outlined by calcium, either as a peripheral ring or uniform distribution.

On the basis of measurements similar to those of Vastine and Kinney, but made separately for the habenular and pineal calcifications, a graph was constructed showing the distance relations of the calcified mass to the anteroposterior and vertical diameters of the skull. In determining possible displacement of the pineal body along the anteroposterior dimension of the skull, allowance should be made for the more anterior situation of the habenular calcification, if the latter is identifiable.

In the present series, habenular calcification indicated a more constant and better localized anatomical point with reference to neighboring brain structures than did the pineal body calcification. It is particularly valuable in stereoencephalotomy, which demands utmost accuracy in cerebral localization.

EDWARD D. HUDACK, M.D.

Roentgen Demonstration of Coarctation of the Aorta (Zur roentgenologischen Darstellung der Aortenisthmusstenose). R. JANKER. *Langenbecks Arch. u. Deut. Zschr. Chir.*, 1953, 274: 548.

It is usually easy to diagnose coarctation of the aorta clinically with the well known signs of hypertension on the upper extremities, and low or absent blood pressure on the lower extremities, very low oscillographic readings in the femoral and popliteal areas, loud systolic murmurs also audible over the neck, paravertebrally and over-distended intercostal vessels, and signs of heart strain on the left side in the electrocardiogram. Indirect roentgenologic signs are aortic configuration of the heart with an absent or little developed aortic knob, and frequent notching of the posterior ribs. Since, however, surgical methods have become available to remove the stenosis, exact localization has become a most important problem.

Further direct roentgen studies are of great value. Fluoroscopy in the left anterior oblique direction, spotfilms, and roentgen-ray movie films which give the choice of many "spotfilms" while the patient is being rotated, often permit sufficiently exact localization of the stenosis. Laminography will give further aid, and often sagittal kymography is of value, showing great amplitudes craniad and small ones caudad to the site of stenosis.

The most precise localization is, of course, achieved with iodine-containing contrast media (perabrodil M-80%). The disadvantage of intravenous angiocardiography is the progressive dilution of the contrast medium and unsatisfactory demonstration of the collateral circulation. Retrograde thoracic aortography under positive pressure gives by far the best results, but must be considered a dangerous procedure as far as the cerebral vessels in longstanding hypertension are concerned.

The author feels, therefore, that this procedure should be limited to the following conditions: (1) the patient must be from 18 to 20 years of age, (2) his condition and that of his heart muscle must be satisfactory, (3) other roentgen-ray methods of

localizing the stenosis must have failed, and, (4) there must be absence of iodine allergy, and parenchymal damage of the liver and kidneys. The author also thinks that growing experience and utilization of all other radiologic methods for comparison, whenever possible, might enable us eventually to avoid the dangerous procedure with contrast media. W. D. BERGMANN, M.D.

Gastric Block. A Disturbance of Gastric Motive Function. BENGT LILJA. *Acta radiol.*, Stockh., 1953, 39: 353.

The author studied a series of 22 gastric resections for ulcers near the incisura angularis. Of these, 18 showed dilatation of the pars pylorica (the portion between the incisura and the pyloric antrum). This atonic dilatation and impaired motor function, with weak, irregular peristaltic waves was shown fluoroscopically and roentgenographically.

Forty-four additional cases of ulceration near the incisura, which had been diagnosed roentgenologically and treated medically, were reviewed and 27 of these showed similar findings. In no case, even after healing of the ulcer, was a reversal of this dilatation shown.

The dilatation and disturbance of motor function may be explained as follows: peristaltic waves originate in the upper portion of the stomach (intrinsically controlled) and proceed distalward via the muscle fibers. In the region of the incisura the circular muscle fibers radiate outward in fanlike fashion to cover the pars pylorica. Now a deep ulceration in the incisura involving the muscle layers may destroy the motor pathway with resultant dilatation and atonicity.

The practical importance lies in the fact that this finding may aid in the selection of cases for surgery, as the dilatation was found to be permanent and associated only with deep ulceration.

The term "gastric block" is used to describe this disturbance of gastric motor function.

JOHN J. GAUGHAN, M.D.

Retropneumoperitoneum Associated with Stratigraphy for the Study of the Suprarenal Glands in the Chronic Arteriopathies of Youth (Il retropneumperitoneo associato alla stratigrafia per lo studio delle ghiandole surrenali nelle arteriopatie croniche giovanili). G. MORONE and F. CESARANI. *Ann. ital. chir.*, 1953, 30: 3.

Seven patients with the juvenile form of chronic arteriopathy were subjected to retropneumoperitoneum associated with stratigraphy. These patients were first irradiated with 100 to 120 roentgens of hard roentgen rays (180 kv. 3 amp. 40 cm. c. f.—distance; filters: 0.5 mm. of copper; 2 mm. of aluminum) over the suprarenal gland opposite to the one to be removed, with the intention of determining its functionable presence (increase in glycemia, height of blood pressure, and number of white blood corpuscles). After this an anteroposterior exploratory film was prepared and then the gas (1,000 to 1,500 c.c. or more of oxygen) was injected by the usual technique for the method of Ruiz-Rivas to produce the retropneumoperitoneum for examination of the kidney.

After the retropneumoperitoneum was produced an anteroposterior exposure was made (the laterolateral projections were not satisfactory) and the same projection was used for the stratigraphic work.

The stratigraphic exposures were made at various distances from the exposure table (or depths); these distances ranged from 4 to 8 cm., depending upon the body build of the patient.

In this material the findings with these methods of examination were not sufficiently constant nor sufficiently convincing to offer any clue as to the etiology or pathogenesis of the disease (Buergers's disease), since most of the findings were adjudged as being within normal limits. In only 1 instance was the left suprarenal gland adjudged to be enlarged and the subsequent removal and histologic examination of this organ proved this assumption to be correct.

However, the author does think that the two methods, that is, the function-stimulating irradiation of the intended residual suprarenal gland (functional test) and the stratigraphic examination (morphologic test) are precise methods of determining the form and function of the suprarenals. This knowledge will undoubtedly, in time, add to our knowledge of the etiology and pathogenesis of the arteriopathies. The technique is very valuable as it eliminates the possibility of unintentional removal of a single suprarenal gland and the removal of too much suprarenal tissue, unilaterally or bilaterally, in the instances of hypotrophic suprarenal glands.

JOHN W. BRENNAN, M.D.

Contrast Media for the Kidneys, Heart, and Vessels, and Their Toxicity. CARL SANDSTRÖM. *Acta radiol., Stockh.*, 1953, 39: 281.

The first attempts at examination of the renal pelvis after the intravenous injection of roentgenopaque salts were made in 1923 by Osborne *et al.*, and in 1928 by Roseno. The former used large doses of sodium iodide, and the latter a medium compounded of sodium iodide and urea. About 1930 several considerably improved contrast media became available. These contrast media, originally intended for the urinary tract are now used during the roentgen examination of other organs, such as the heart and vessels, for which the amount of contrast injected, calculated in kilograms of bodyweight as well as per unit of time, is usually larger than that employed for urography. The risk of the development of side reactions, however, has consequently increased. The toxicology of the urographic contrast media has become an important question.

The experience of the authors with 9,897 urographies and 80 angiocardiographies is described. In the 80 cases of angiocardiographic examination, umbradil and its derivatives have been used in

doses up to 80 ml. (70% solution) without a single instance of injurious secondary effects. In a group of 4,930 urographic examinations which constituted the earlier cases only 20 instances of serious side reactions developed. There were no deaths. The author thought that in a few cases the secondary effects were produced by the considerable degree of compression on the abdomen rather than by the contrast media. In 1 patient with a marked decrease in blood pressure the blood pressure returned to normal in a few minutes after removal of the compression. In 3 of a test group of 100 cases in which the compound medium Dijodon D was used, untoward reactions were observed; they were serious in 2 of these cases. One of 5 patients who were given perabrodil ampules of early manufacture (probably 8 to 10 years old) had a severe reaction; he became cyanotic and short of breath, and presented profuse perspiration and urticaria. In a group of 4,867 cases in which umbradil (35%) was used in doses of 20 to 40 ml. there were negligible local and general side reactions. In 8 of these patients, however, extensive urticaria developed, 2 patients had repeated vomiting which ceased after 15 minutes, and 2 had shock symptoms which were more serious in character. The author believes that it is important to have a plan of treatment when reactions occur, and to have available the instruments and medical equipment to take the necessary preventive measures quickly and effectively in the event of an emergency.

FRANK L. HUSSEY, M.D.

Cerebellar Medulloblastoma: Treatment by Irradiation of the Whole Central Nervous System. EDITH PATERSON and R. F. FARR. *Acta radiol.*, Stockh., 1953, 39: 323.

The prognosis in cases of medulloblastoma of the cerebellum has for many years been regarded as fairly hopeless. There are, however, a few authenticated cases reported with long survival following treatment. For this reason the authors describe the methods for treatment which have been used over the last 10 years on proved cases of this disease, methods which have yielded over 50 per cent survival at 3 years following treatment. With these encouraging results they have adopted, over this period, the principle of irradiation of the entire brain and cord as one undivided volume. This principle stems from the postmortem findings in untreated cases of this disease which almost universally show deposits in the brain and cord which have seeded from the primary cerebellar tumor. The actual technique of delivery of the dosage has evolved with the growth of experience.

Between 1941 and 1950, 27 patients were treated on the above principle. All had section-proved medulloblastomas. Twenty-two of the patients were children and their ages were evenly spaced between 14 months and 13 years. There were twice as many boys as girls. Of the 5 adults, 2 were men and 3 were women, with an age range between 25 and 38 years. All the patients were referred from neurosurgical units as soon as possible after surgical exploration. In the majority of the cases partial removal of the tumor had been effected; in a few cases only a biopsy had been taken; in 1 case the surgeon thought that the local tumor was probably removed in its entirety. Vomiting and headache were the most common primary symptoms, with ataxia following. Muscular weakness and diplopia or squint were complained of in the majority of cases, and in a few cases other cranial nerves were involved. Irritability was common. Rarer symptoms were speech defects and loss of consciousness or fits. Nearly all of the patients were found to have nystagmus and all of them had papilledema.

The method of treatment consisted of irradiating the entire central nervous system. The whole brain was included, care being taken to subtend the base of the brain and yet protect as far as possible the anterior half of the eyeball. The depth of the medulla and cord from the skin were ascertained by lateral roentgenographs of the spine. A single spade-shaped posterior roentgen ray field is used, which subtends the whole brain and cord. Every effort is made to arrange the patient so that his back is as level and horizontal as possible. To obtain a uniform beam it is necessary to employ a large focal skin distance equal at least to twice the length of the field at skin level. A specially designed wood table with interlined 3 mm. thickness of lead, and an open slot of variable width and length was constructed for placement above the treatment table to expose the narrow field of the spinal cord for treatment. The x-ray tube was tilted 20 degrees from vertical toward the head. The dosage rate at various standard anatomical points was measured for each patient, on the basis of the field size and focal skin distance chosen for the patient. Total "minimum tumor" doses were prescribed as 3,000 roentgens spread over 3 weeks and 3,500 roentgens spread over 5 weeks. The corresponding doses for spinal skin were 20 to 30 per cent higher, but varied from level to level in accord with the thickness of the overlying tissue. The treatment was started with a low daily dose for the first few days. Supplementary radiation was required to raise the dose to the minimum figure throughout the head. The posterior field had to be opposed by a field or fields so directed that the whole brain was subtended, yet the orbital contents, especially the front of the eye, were spared as far as possible. One anterior field on the forehead with sufficient area to subtend the head and directed so that the lower border included the base of the brain, or two angled anterior fields which avoided the back of the head as far as possible could be used.

The skin dose over the occiput should not exceed 5,000 roentgens in 5 weeks as permanent changes in the skin and hair are likely. The minimum dosage levels prescribed for the brain for most of the patients was 3,500 roentgens over 5 weeks or 3,000 roentgens over 3 weeks. The authors suggest that 4,000 roentgens are more desirable. The cord should

receive at least 3,500 roentgens over a 5 week period.

Cases of medulloblastoma should be referred to the neurosurgeon before treatment for exploration and returned as soon as possible for radiotherapy. Prompt decompression is a gain to the patient, as well as is a definite biopsy report.

In this series of cases 5 patients who showed signs of recurrence in the cerebellum were referred back to the neurosurgeon for an opinion as to whether the symptoms were due to recurrence of the tumor or to late irradiation. In each case the neurosurgeon concerned explored the posterior fossa and found a massive recurrence. This information has been of value to them in considering optimum dose levels.

There were 11 (65%) patients of the 17 with proved sections who were living at the end of 3 years and 5 of the possible 7 who were living at the end of 5 years. In general, the physical condition of both the children and adults is good. In 1 of 11 patients surviving for 3 years or more, severe optic atrophy with blindness has occurred. In several others the discs are pale. The mental development of the children, on the whole, has been about average. One, however, was severely retarded. This patient was the only one who had had convulsions on admission and remained mentally disorientated during the entire stay in the hospital. The radiation sequelae were not very significant. Three patients developed distant metastases, chiefly in bone; one of these was found at postmortem to have also a recurrence in the cerebellum and cord. The principle of treating the entire central nervous system follows the known mode of extension of the disease.

FRANK L. HUSSEY, M.D.

MISCELLANEOUS

Failures, Flops, and False Localizations in Tracer Technique. K. E. CORRIGAN and H. S. HAYDEN. *Radiology*, 1953, 60: 870.

Although the tracer technique presents a precise physical modality, it has pitfalls of which we must be continuously aware if they are to be obviated.

In the present series, 13 failures were encountered in 2,711 tracer studies. These consisted of 3 carcinomas of the thyroid which were missed and 3 cases which were believed to be carcinoma of the thyroid but could not be substantiated. Four instances of mediastinal involvement were included in this group. One of these was a frank erroneous conclusion and the 3 others consisted of correct identification of one of two entities present. One hundred and nineteen instances of carcinoma of the thyroid were identified correctly by the tracer technique. Of these, 14 were totally unsuspected at the time the tracer study was performed.

A diagnostic problem, the second unknown of the present series, was reviewed in which the tracer showed a distorted thyroid with some retrosternal extension and poor concentration of tracer in the mass. The ultimate findings proved the lesion to be tuberculous thyroiditis. Subsequently, 28 cases of thyroiditis were encountered, none of which was mistaken for neoplasm. Active thyroiditis is characterized by the presence of hyperactivity outlining the acute area which is quite inert in its central portion. Damaged areas of the thyroid present an absence of function. Residual normal tissue exhibits average activity and will not show the abnormal drop characteristic of malignant change.

A patient with numerous clinical entities was found by tracer study to have a thyroid carcinoma which was not diagnosed clinically. Detailed tracer studies showed an area of increased activity over the left kidney, first believed to be an active metastatic thyroid carcinoma but later proved to be hydronephrosis. Pyelograms were not obtained because of the patient's condition. The increased tracer activity was due to the retained urine.

Two examples were cited of how increased activity due to tracer present in hyperactive thyroid tissue or accumulated edema fluid following a surgical procedure can vitiate the diagnosis. When changes occur which are associated with surgery or trauma, the interpretation of any isotope localization must be approached with extreme caution.

Another serious source of difficulty can be the presence of two separate entities, the more significant one eliciting the fewer signs. This may be the situation in the existence of a retrosternal thyroid. In the present series, 5 patients with retrosternal thyroids had second lesions which happened to be the critical ones. Two had aneurysms in the presence of mediastinal thyroids and 3 had neoplasms of origin other than the thyroid. An illustration was given of how an aneurysm or a tumor of other than thyroid origin may mechanically displace the thyroid into the mediastinum and give a confusing tracer pattern.

Incomplete techniques can be the source of serious error. An illustration was also given of a patient whose study was incomplete. The impression was that he had a posterior mediastinal thyroid, but the lesion proved to be an intrinsic lung tumor.

The rationale was discussed for administering P-32 when the differential diagnosis of a mediastinal tumor is in question. EDWARD D. HUDACK, M.D.

Radiation with the Cobalt-Isotope Co^{60} for Bronchial Carcinoma after Resection of the Lung (Strahlentherapeutische Anwendung des Kobalt-Isotops Co^{60} nach operativer Behandlung von Bronchialcarcinomen). W. E. J. SCHNEIDRZIK, C. WINKLER, and A. KUSKE. *Langenbecks Arch. u. Deut. Zschr. Chir.*, 1953, 274: 538.

The authors discuss 3 cases of bronchial carcinoma in which, after pneumonectomy, the patients were treated with cobalt isotope Co^{60} radiation.

They used Foley's sondage which contained the cobalt isotope in the bulb; the latter was fixed in the hiliary region of the mediastinum. Foley's sondage had two tubes, one with the Cobalt isotope in the bulb and the other for drainage.

This is the first time that radioactive isotopes have been used in the interior of the chest after pneumonectomy; in this manner the dosage can be regulated and it is possible to see the capacity of the dose.

This is a method which, regulated in its application, could play an important role as a preventive measure.

The article contains diagrams and several sketches showing the power of the cobalt-isotope Co^{60}.

MARIANO LOPEZ-BELIO, M.D.

The Circulation of Radiation-Damaged Skin. Radiosodium Clearance Studies. BERNARD ROSWIT, LAWRENCE H. WISHAM, and JOSEPH SORRENTINO. *Am. J. Roentg.*, 1953, 69: 980.

Seventy-four clearance rate studies were done on 37 individuals in a temperature-controlled room. The patients had been treated during the past 10 years for various malignancies with an average of 6,000 roentgens delivered to the skin in a time period from 30 seconds to 100 days. Different sized portals were used, as was the Marks grid in 6 cases; half value layers ranged from 0.3 mm. of aluminum to 7.1 mm. of lead. In each test, 1 to 3 microcuries of radiosodium were injected intradermally in the irradiated skin and an identical normal site on the opposite side of the body.

Of the 37 subjects, 9 had slower clearance rates in the irradiated skin than in the normal skin and 24 individuals had slower clearance rates in the normal skin than in the irradiated skin. If a 20 plus or minus per cent inherent error is allowed, then only 1 patient had a slower rate in the irradiated skin and 12 individuals had faster clearance rates in the irradiated than in the normal skin. Clearance rates in both the normal and irradiated skin were decreased with adrenalin and increased with histamine. There was a difference of less than 1° F. in temperature in the irradiated and control sites.

The authors present many reasons why they think that the radiosodium clearance test is valid. They demonstrated differences in the clearance rates in the skin, subcutaneous tissue, and muscle. Skin of the face had a faster clearance rate than skin of the abdomen because of a richer blood supply. Increase in the clearance rates were noted in pedicled grafts as circulation in the pedicle improved; the tourniquet test, sympathectomy, roentgen therapy and reflex stimulation of the skin all showed physiological changes in the rate of flow of radiosodium. Cannulation of the femoral vein and thoracic duct of the dog showed that very little of the radiosodium was collected by the lymph channels and that 98 per cent appeared in the blood system.

Biopsies of fifteen heavily irradiated areas showed typical damage with narrowing of the lumen of the vessels. However, new capillaries were also noted microscopically. The authors are of the opinion that these partly stenosed vessels and the new capillaries maintain an adequate blood flow in irradiated tissues. Late radiation damage is then due to direct destruction of the cells by radiation and not due to a decreased blood flow. The "pallor" of irradiated skin is due to the hyalinization and densification of the subepidermal structures.

The authors present the radiosodium clearance test as a physiological test for the blood flow in irradiated tissues and give considerable experimental data supporting the validity of the radiosodium clearance test. STEPHEN P. SEDLAK, M.D.

MISCELLANEOUS

CLINICAL ENTITIES—GENERAL PHYSIOLOGICAL CONDITIONS

A Symposium on the Role of Cytologic Diagnosis in Surgery (Le rôle du diagnostic cytologique en chirurgie). M. KLEIN, CL. BOLLACK, G. STOLL, R. BOURG, and Others. *Acta chir. belg.*, 1953, 52: 507.

KLEIN states that a thorough knowledge of normal and abnormal structures and of usual and unusual formations is essential for correct cytodiagnosis. Such knowledge can be acquired only by long, practical experience and not from textbooks or atlases, no matter how well edited.

At present the chief domain of cytodiagnosis is the recognition of the character of epithelial proliferation, especially detection of neoplasms located in regions which render biopsies impossible. The main problem which confronts the diagnostician is the differentiation of a malignant tumor and advanced metaplasia. It is the clinician's duty to correlate the cytodiagnostic findings with the results of other tests and investigations, and to draw conclusions as to proper therapy.

In a large percentage of the author's material cytodiagnosis was able to dispel doubt as to the diagnosis and thus contributed to an early institution of the proper treatment of malignant tumors.

Advanced lesions or infections superimposed upon the tumors render the cytologic diagnoses more difficult.

Especially encouraging results are furnished by cytodiagnosis of lesions of the male genitourinary tract.

Whenever a needle biopsy is obtainable, the author prefers sections to cytodiagnosis of the smears.

BOLLACK discussed aspiration biopsy and needle biopsy in general surgery.

He states that the value of cytodiagnosis for early detection of carcinoma of the lung is firmly established. Whenever the interpretation of roentgenograms is difficult, bronchial lavage or aspiration should be done to obtain material for cytologic examination.

Less satisfactory results are obtained in gastric lesions because the interpretation of the great variety of cellular formations usually seen in smears is not easy. The diagnosis is rendered still more difficult by rapid modifications of the normal cells caused by autodigestion. Finally, metaplastic cells of an old ulcer may bear a great resemblance to exfoliated cells of a neoplasm. Cytodiagnosis is of considerable value for the diagnosis of a small, noninfected carcinoma in a patient without an ulcer history and with no gastric retention.

Cytodiagnosis of prostatic secretion obtained by massage furnishes mediocre results. On the other hand, examination of needle biopsy specimens obtained through the transperineal route is much more satisfactory. Both a smear and slides can be prepared from the material obtained by this method.

Aspiration biopsy of vesical lesions, especially at the junction of normal and pathologic tissues, allows the preparation of smears as well as of slides.

On rare occasions correct cytodiagnosis can be made by examination of the urine specimen obtained by catheterization of the renal pelvis.

Examination of pleural or peritoneal fluid obtained by aspiration is a valuable diagnostic procedure. Smears or even sections of material obtained by puncture of primary or metastatic bone tumors facilitate the diagnosis. The same method is applicable to subcutaneous tumors or tumors of the salivary glands.

STOLL reported on needle biopsy and minute biopsy in the exploration of certain endocrine glands. He states that examination of minute biopsies or microbiopsies of easily accessible endocrine glands, namely the testes, and the mammary and thyroid glands, represents a valuable addition to our diagnostic armamentarium which heretofore consisted only of spermograms and determination of the excretion of 17 ketosteroids. Spermograms do not furnish any information as to the condition of the interstitial gland, while minute biopsies give a morphologic picture of that organ as well as of spermatogenesis. As many as 30 seminiferous tubules and intertubular tissues can be seen in serial sections.

In paraplegic patients testes undergo profound modifications. A marked atrophy of spermatogenic structures can be observed. This fact demonstrates the control of the genital organs by the nervous system. Intensive treatment of paraplegics with testosterone accomplishes two tasks: it establishes a positive nitrogen balance and exerts a favorable influence on the nutrition of the seminiferous tubules.

Minute biopsies help in the detection of the cause of sterility, such as obstruction of the efferent paths of the testis, cryptorchidism, or sequelae of inflammatory processes or chronic alcoholism. Neither edema nor hematoma followed the procedure of obtaining minute biopsies in 30 patients.

The Silverman needle is used for needle biopsy of the thyroid gland. No untoward effects followed this procedure on 50 patients. Repeated biopsies may be obtained to check the efficacy of treatment. The benign or malignant character of hypertrophy can be determined and the morphologic evolution of the gland may be followed up. It goes without saying that the cytologic findings are only an aid in the diagnosis to be made by the clinician.

BOURG reports on the value of exfoliative cytology for the surgical decision regarding cancer of the cervix or of the body of the uterus. He draws the following conclusions from studies of 10,000 smears of the female genitalia in nonpregnant women.

Great patience is required because frequently a very large number of smears must be carefully reviewed. The smears, obtained from close proximity to the lesion, should be placed into a mixture of equal parts of alcohol and ether. Papanicolaou's pipette is used to obtain specimens from the body of the uterus. Dry smears are not suitable for investigation.

In the diagnosis of suspicious lesions of the cervix, cytologic examination should supplement colposcopy, Schiller's test, biopsy, or curettage. In case of doubt smears should be repeated and if no conclusive results can be obtained, conization of the cervix should be performed to allow study of serial sections. Cytologic examination does not permit determination of the location or depth of the lesion, two factors important to the surgeon. No more than 2 or 3 per cent of early carcinomas or cancer in situ escape detection by a cytologic examination.

In a small number of cases of cancer of the body of the uterus, the histologic diagnosis is unequivocal while the smear may furnish negative results. In the presence of glandulocystic hyperplasia of the endometrium or an endometrial polyp, smears may arouse an unjustified suspicion of malignancy. In postmenopausal stages the occurrence of positive cytologic and negative histologic findings is considerably less frequent. To avoid misleading conclusions the question should be asked whether the patient had been given estrogens.

If endocervical smears give positive results, one can avoid diagnostic curettage in an elderly bleeding patient without a cervical lesion. Under such circumstances the extension of the lesion and its soft consistency, vascularity, or secondary infection make curettage a dangerous procedure. On the other hand, curettage should be performed in a younger person with intermenstrual hemorrhages if the results of smears are positive or suspicious.

Cytologic examination renders a great service in the detection of carcinoma which coexists with bleeding uterine fibromas.

DENOLIN-REUBENS and DURIEN discuss Pappenheim's method of dry, stained smears for the demonstration of cancer cells in the sputum and in pleural and peritoneal effusions. They report the results and limits of this method.

Demonstration of malignant cells in the sputum or in effusions constitutes one of the most useful applications of cytology. The method is particularly valuable for the diagnosis of lesions not accessible to bronchoscopy.

After centrifugation of the effusion fluid to be examined, the sediment is spread over a slide and dried in the air. Sputum is collected in dry containers and white or blood-stained portions are selected for the study. The Pappenheim stain, also called the May-Gruenwald-Giemsa stain, is used because it creates the best contrast between normal and cancer cells.

The authors employed this method of study of effusions in 95 patients with noncancerous lesions and in 110 patients with carcinoma. The sputum was examined in 122 patients with probable bronchial cancer, 6 with pulmonary metastases, and 184 with nonmalignant lesions.

The cytologic method has proved its value for the diagnosis of cancer. In 69 per cent of the cases of cancer demonstrated histologically, positive results were found in the sputum and in 65 per cent of the entire series positive results were found in effusions.

DUSTIN discussed the role of needle biopsy in the diagnosis of carcinoma.

A spinal puncture needle attached to a 20 c.c. syringe is used by the author for exfoliative cytology. From 80 biopsies he selected a group of 65 for discussion. The diagnosis in this group had been confirmed histologically in 37 and clinically in 27, and disproved by biopsy or evolution in 3. While Papanicolaou's staining method is preferable for the study of vaginal smears or the sputum, May-Gruenwald-Giemsa's method is more desirable for the study of tumors, pleural effusion, or ascites.

The needle biopsies were obtained from lymph glands, osseous lesions, the breast, or lungs.

In 1 patient a small pleural metastasis was provoked by a transthoracic needle biopsy. However, if other diagnostic methods are not available, such a procedure is justifiable in spite of the danger of dissemination of the cancerous cells. A parietal metastasis may be treated surgically or by radiation and presents no problem in the face of an existing bronchial carcinoma. A much greater danger lies in the fact that the malignancy may be erroneously diagnosed. A rapidly growing mediastinal teratoma was wrongly diagnosed by the author as cancer.

The cytologic method is considered simple, rapid, and convenient. Although the percentage of errors is not small, the results of needle biopsy, if judiciously used in conjunction with other methods, are very valuable for the diagnosis of cancer.

ELIAS discusses the role of cytologic analysis of the sputum in the diagnosis of primary cancer of the lungs.

His study is based on the observation of 2,300 smears obtained from 560 patients.

Cytologic analysis is especially valuable in cases in which bronchoscopic biopsy cannot be obtained because of the location of the lesion or in which the biopsy furnishes negative or doubtful results.

The author objects to the use of swabs to obtain bronchial secretion because the admixture of blood makes the smears unsatisfactory and because the cotton of the applicator retains numerous cells. Moreover, desiccation may begin before fixation of the specimen. Aspiration of secretion from the suspected bronchus is the method of choice. Cautious bronchial lavage followed by aspiration also furnishes good results, although dilution of the mucous secretion in saline solution causes loss of cells at the time of fixation.

Numerous statistics indicate that the analysis of bronchial secretion is less satisfactory than that of sputum. Furthermore, the last mentioned method

is simpler than bronchoscopy which is a painful and sometimes contraindicated procedure. When bronchoscopy is justified, the condition of the patient is usually so advanced that cytologic examination is superfluous. Hence the author prefers sputum examination for the detection of early stages of malignant conditions. A specimen obtained soon after awakening of the patient is preferable.

False negative results are obtained if a primary submucous tumor or intralymphatic pulmonary metastases without communication with a bronchial lumen are present, or if a complete bronchial stenosis above the tumor or an advanced necrosis of the neoplasm develops.

Sputum examination may furnish positive results and a study of the bronchial secretion may give negative findings, and vice versa. The last-mentioned situation is usually attributable to a faulty technique which can be avoided if specially trained laboratory personnel and not the referring physician prepares the smears. The author places the specimen in a mixture of equal parts of ether and 95 per cent alcohol and employs Papanicolaou's staining method. Four smears of each specimen are prepared.

Not only the benign or malignant character of the cells but their histologic type can be determined.

Among 208 patients whose sputum was examined, cancer was found in 37, and in 28 of these cytodiagnosis gave positive results.

JOSEPH K. NARAT, M.D.

A Review of the Influence of Bacterial Infection and of Bacterial Products (Coley's Toxins) on Malignant Tumors in Man. HELEN COLEY NAUTS, GEORGE A. FOWLER, and FRANCES H. BOGATKO. *Acta med. scand.*, 1953, 145: Supp. 276.

The authors present a detailed analysis of 30 cases of inoperable malignant tumor treated by Coley's mixed toxins. Each diagnosis was confirmed by microscopic examination.

The series of cases begins with a case diagnosed in 1893 as a spindle-celled sarcoma of the abdominal wall, the original case treated by Coley. Thirty cases in all are reported in detail, in 11 of which the patients were reported as living when traced in 1952 or 1953.

The most recent case reported in the series was that of a patient with papillary cyst adenocarcinoma of the ovaries; it was diagnosed in 1933. This patient is one of those which are still alive without evidence of recurrence and is reported as in good health 20 years following the original diagnosis.

As an introduction to the article the authors give a short historical background of Coley's toxins. In addition, a discussion of the technique, and the difficulties encountered in treatment, as well as an index of various preparations of Coley's toxins are included.

W. FOSTER MONTGOMERY, M.D.

EXPERIMENTAL SURGERY

Experimental Study of Pleural Shock. SHIGERU IIDA. *Mie M. J.*, 1952, 3: 159.

The author, using cats in the experimental laboratory, produced evidence to support the following observations:

Pleural shock did not result from the injection of hot and cold water into the pleural cavity.

Shock developed following the injection of iodine and hydrochloric acid into this cavity. In this state, there was low blood pressure and bradycardia.

Shock also developed after the injection of acetylcholine into the pleural cavity; however, it was not produced by the injection of adrenaline and pilocarpine.

Pleural shock was arrested by the subcutaneous administration of atropine before the injection of various chemicals into the pleural cavity.

Freezing of the body produced a predisposing state of pleural shock.

After the cutting of both vagi, pleural shock did not occur. Therefore, pleural shock in cats seems to occur by a reflex through the vagus nerve.

The author believes the typical manifestations of pleural shock are low blood pressure and bradycardia, analogous to those of the initial shock occurring after head injuries.

W. FOSTER MONTGOMERY, M.D.